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This Week in The IRON AGE

Vol. 156, No. 17 October 25, 1945

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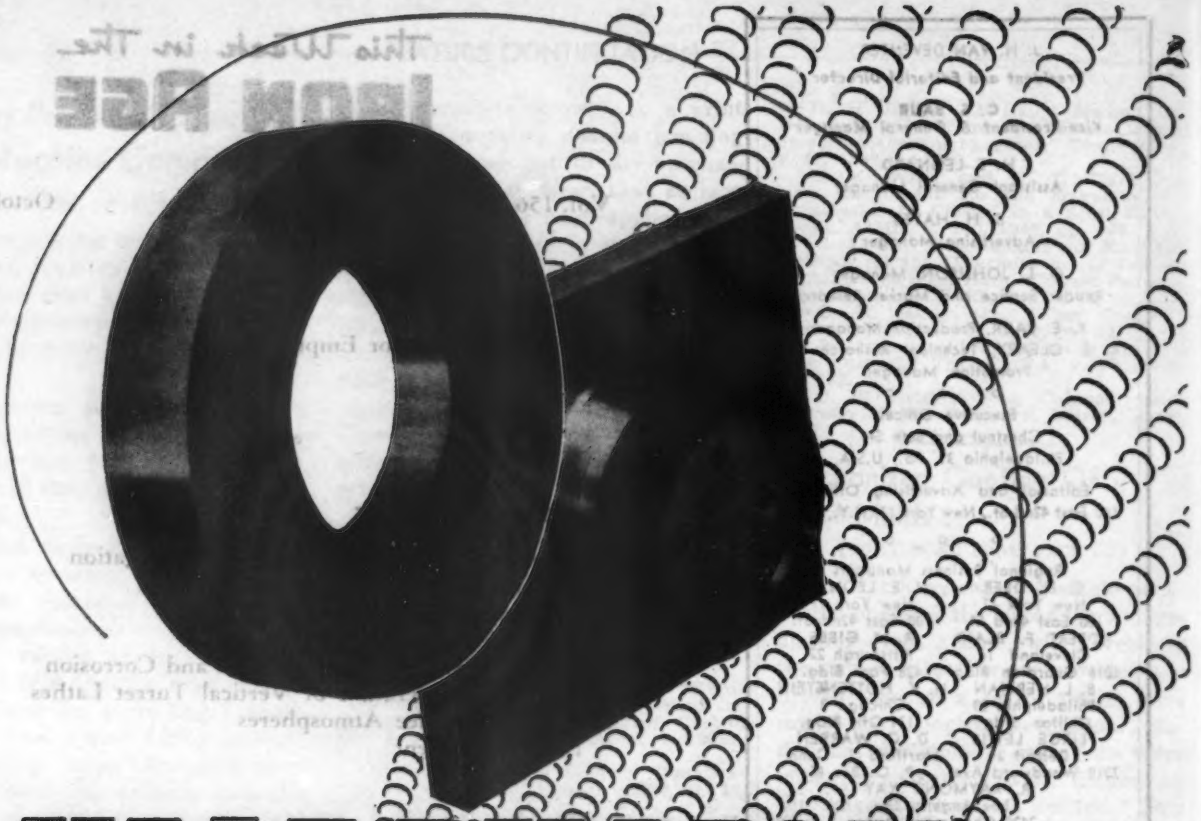

over a HALF BILLION "cookies" .... and STILL GOING

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The IRON AGE

ESTABLISHED 1855

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October 25, 1945

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Social Security for Employers

"SOCIAL SECURITY" is one of those resounding terms which are so popular today because they can mean almost anything that those who hear or read them want them to mean. They are not handicapped by definition but are elastic in nature and can be stretched to encompass any given amount of votes.

Since it is not definable, what I may take it to mean may not coincide with your interpretation, which is quite all right because variety is the spice of life in opinion as in other matters. What I take it to mean is the endeavor to alleviate or eliminate certain risks for certain people, primarily our wage earners. Certainly legislation, in effect and proposed, has this motivation. It is aimed at establishing protection for the worker in his job, in his wages, in his dealings with the boss, (not including his union boss, of course) and at insuring him as far as possible for unemployment and for old age. As to the latter, it must in fairness be said that the employer, if on a payroll, comes in for his share of pension protection.

Before the meaning of the term has jelled and while it is still elastic, I think it would be a good idea to consider taking social security out of its class conscious construction and stretching it to admit the employer to its other benefits also. Certainly the present-day employer who makes jobs, or tries to, and who pays wages encounters plenty of occupational hazards. One in particular is the hazard met by him today in keeping his plant open for business in the face of wildcat strikes.

I believe that most employers are willing to accept the principle of collective bargaining. What they object to and what they need protection from and have not is that after the bargain is made and the instrument sealing it is signed and delivered, one party to it can toss it overboard as nonchalantly as you would toss a cigar butt from a ferry boat.

Under the present one-sided and strictly class legislation that exempts labor from the due processes of law as regards the observation of contracts, the only safeguard against unsocial insecurity for the employer is the caliber and character of the union leadership with which he negotiates and agrees.

Mind you, there are good unions that live up to their contracts. Such unions and their membership have nothing to lose and much to gain in achieving a state where other unions are compelled to be equally scrupulous in the observance of their commitments.

Damage by wildcat strikes is not confined to the men striking or the company struck. Irresponsible action by a comparatively few can and has caused widespread loss of time, wages and company earnings even remote from the source. To permit such action is the antithesis of social security in any sense.

Top union leadership, however well intentioned, has demonstrated its inability to control these epidemics. But there are plenty of laws already on the statute books providing recourse for contract violation. Removing the exemption to such laws now favoring labor unions and putting all Americans on an equal footing in this respect would go a long way toward curing this particular trouble.

J. H. Van Deventer

Metallurgists and steelmakers review all orders that enter the Inland mill.

Steelmakers Confer With Metallurgists... on every order...at Inland

When an Inland metallurgist is away from his office—and that may be a large part of each day—he can be located in the mill. He may be in a superintendent's office talking processes, he may be at an open hearth furnace following through a heat, or he may be at a mill laboratory getting a record of physical tests.

This close cooperation between steelmakers and metallurgists is an important factor in producing quality steel, in improving processing methods, and in meeting the exact requirements of each Inland customer. Inland Steel Company, 38 S. Dearborn St., Chicago 3, Ill.

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INLAND STEEL

THE IRON AGE
Oct. 23, 1945

NEWS FRONT

► Reconversion of the automobile industry is practically complete now, with a current production rate of 1400 passenger cars and 750 trucks a day. Barring major strikes, November production should exceed 6000 units per work day.

Packard redesign includes a coil spring expanded piston ring designed for uniform radial pressure on the cylinder wall and to avoid oil slot clogging. There is also a new steering gear arrangement and a new type of crankcase bearing material.

► OPA has invited steel warehousers to apply for increases in price ceilings to cover increased costs incurred in enforced buying from other than customary suppliers and subsequent fabrication for customers' requirements.

► Hydraulic controls for tractor-mounted tools will replace the prewar mechanisms involving levers, screw adjustments or balance springs. Among other advantages, this development will permit forcing implements into the ground and holding them there at desired depths despite variation in soil conditions.

The industry is going as far as West Coast aircraft suppliers for design and production of hydraulic mechanisms.

New models of tractors are designed for the elimination of dead weight by using welded construction for frames and housings. Better traction afforded by rubber tires makes this possible.

► An increase in welding current of 76 pct, representing an increase in welding heat of 320 pct, can be obtained by using a spot welding machine at its minimum throat as against maximum throat.

Tests to determine to what extent the secondary current of a spot welder is affected by various conditions of the secondary loop also disclosed that maintaining a constant throat opening and throat depth needlessly limited the maximum current obtainable from the machine and wasted electrical power when the throat opening was very much larger than is necessary.

► Before making tools from high-speed steel, inspection of longitudinal sections by the wet-continuous Magnaflux method provides a rapid and accurate indication of quality.

Extensive Magnaflux indications of segregation and austenitic retention, having a definite stress-raising effect, definitely affects tool life.

► Use of sectional carbide nib molds by the Firth-Sterling Steel Co., McKeesport, Pa., facilitates recutting, thus limiting the life of the mold only by the amount of stock which is removed. In addition to being recut to original size, a sectional nib mold also may be recut to large sizes within the limits of the nib diameter.

► The addition of a line of alloy steel cold finished bars will likely be made by Jones & Laughlin Steel Corp. to its already complete line of carbon steel bars. J & L is expected to purchase hot-rolled alloy bars and cold draw them, but it is not expected that the company will do any hot-rolling in alloy lines at present.

► Production by Kaiser-Frazer has cast no premonitory shadows in the machine tool market. Still in the design stage, aluminum hood tops and rear deck panels are said to be seriously under consideration. Production appears to be from eight to twelve months away. Then according to rival manufacturers, attention will shift from Willow Run to will-it-run.

► The Germans perfected a method of producing high-grade iron powder directly from liquid metal in a machine of very simple design. Output ran into the thousands of tons, great quantities being used for sintered iron rotating bands for shells which performed better and actually gave as much as 20 pct longer barrel life than the copper rotating bands conventionally used.

U. S. experiments with sintered iron rotating bands were dropped after test firing disclosed drastic reduction in gun barrel life.

The simple German powdering machine also turned out large quantities of all other nonferrous and ferrous powdered metals.

Magnetic Particle Detection Of

Retained Austenite and

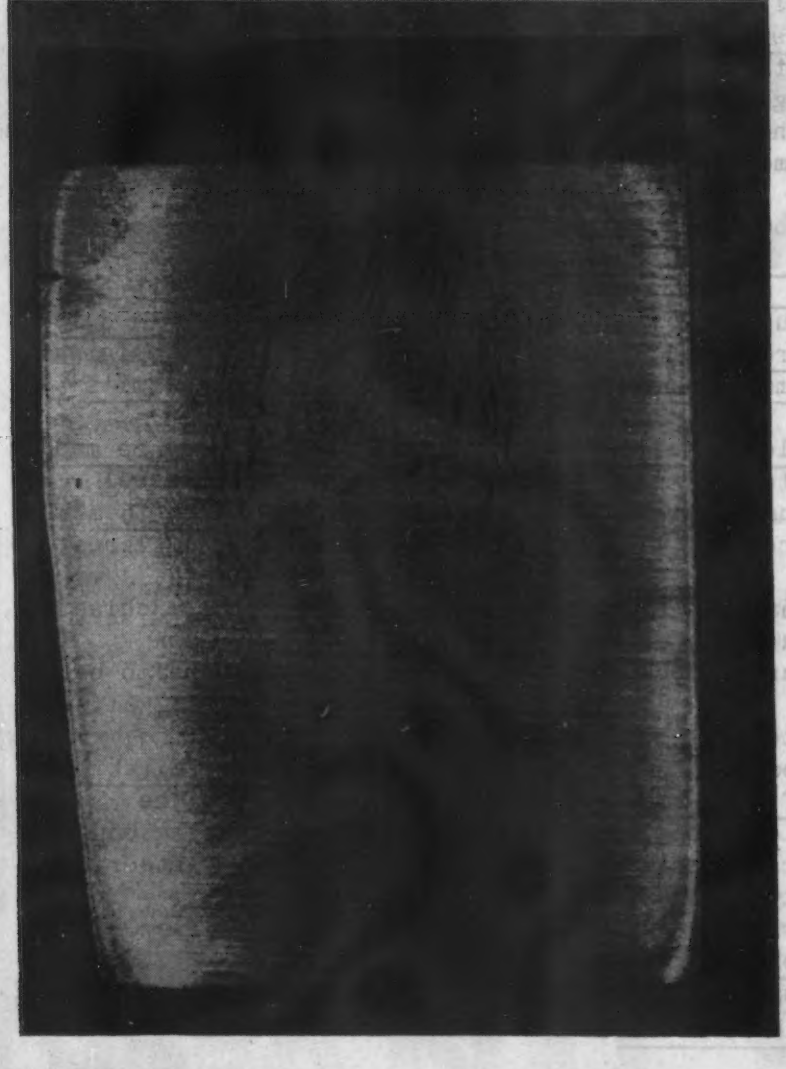
THE examination of tools, welds and aircraft parts are some of the most popular present day applications of the magnetic particle inspection method (Magnaflux). This nondestructive test is carried out by making use of continuous and residual magnetic fields that can be created in ferromagnetic materials. Application to the magnetized piece of fine iron particles in the form of a wet suspension or dry powder gives pattern indications. The defects found by this method are generally classified as cracks, laps, slag, and lack of metal fusion. However, the author herein will discuss Magnaflux indications resulting from carbide segregation and retained austenite in high-speed tool steel and not patterns due to the aforementioned defects.

During the examination of high-speed tools by magnetic particle methods, build-ups were noticed near the horizontal axes of the tools. This was particularly evident on large reamers and counterbores, the shanks of which tapered sufficiently to expose the original bar-stock centers, and also on the transverse section of the boring tool pictured in fig. 1. The magnetic particle indications seemed to be unaccountable, for no cracks were disclosed upon closer examination. The frequency of occurrence of the observed phenomena justified further investigations.

The tool steel under investigation had the following range of analysis:

	Pct
Carbon	0.76 to 0.82
Chromium	3.60 to 4.10
Tungsten	1.40 to 2.00
Vanadium	0.95 to 1.25
Molybdenum	8.00 to 9.00

FIG. 1—Back view of a boring tool showing magnetic particle indications of segregation and retained austenite on the transverse section. Actual size.



In tool steel of this type, austenite that is formed during heat treatment, and carbide segregates, will always be present. The distribution of the segregates within the bar stock is dependent upon mill practice in casting and reducing the original ingot.[1] The most desirable steel bars will have only small amounts of carbide stringers at the center.

In the annealed condition the nonmagnetic carbide stringers are distributed in a matrix of ferrite and sorbite.[2] The segregation has a banded appearance and will be of relatively the same nature after heat treatment. The matrix is sufficiently magnetic while a continuous high current is passing through it to attract fine iron particles.

Microscopic examination at 100 X of a heat-treated specimen etched with 10 pct nital, reveals white stringers and a background of tempered martensite. The tempered martensitic areas have magnetic properties. Under the influence of an electric current flowing continuously, the martensite develops a magnetic field, and if current is strong enough, residual magnetism is set up.

A small amount of austenite is retained even in correctly hardened and tempered pieces. It is a nonmagnetic constituent,[3] and in the same manner as segregates, interrupts the magnetic fields of the matrix. Multiple

Carbide Segregation . . .

By RICHARD J. DOOLEY
Newport, R. I.

. . . Before making tools from high-speed steel, inspection of longitudinal sections by the wet-continuous Magnaflux method provides a rapid and accurate indication of quality. The author herein shows how segregations and areas with retained austenite are found by this method.

tempering operations will further break down the remaining austenite. However, in areas of heavy carbide segregation, it is doubtful if this phase can be further transformed by additional heat treatments—the high alloy concentrations are too sluggish to respond in a normal manner.

[1]*James P. Gill, "Tool Steels," p. 114.*
[2]*J. L. Gregg, "Alloys of Iron and Tungsten," pp. 95-136.*
[3]*Ibid, pp. 284-332.*

In the annealed and hardened states, leakage fields are created when a suitable electric current is passed through the steel containing nonmagnetic constituents. When fine iron particles are applied, they gather at interruptions in the magnetic field (the austenite and segregation). These are the powder patterns observed in the areas under examination.

Test specimens were taken from bar stock used in making boring-tools. Transverse test pieces measured 1¼x1x¾ in., and longitudinal ones taken at the center of the bar were 1x3x⅝ in.

Annealed, the hardness was 95 to 100R_b; in the hardened and tempered condition, 62 to 63 R_c. All surfaces were ground with a 36-05 BE Norton wheel; after which, some pieces were given a final high polish for metallographic examination.

A transfer (Magnaflux equipment) which provides high amperage and low voltage alternating current was used. First, the pieces were demagnetized by withdrawing from a solenoid using 2500 amp. The test specimens showed no tendency to attract iron filings at areas of discontinuity. Next, magnetization was effected by allowing the current to flow through the pieces. In the longitudinal specimens the current flow had to be in the same direction as the elongated carbide segregates to get maximum field strengths; in the transverse pieces the direction of current flow was not important. It was found necessary to use higher current densities than is the general practice for locating cracks.

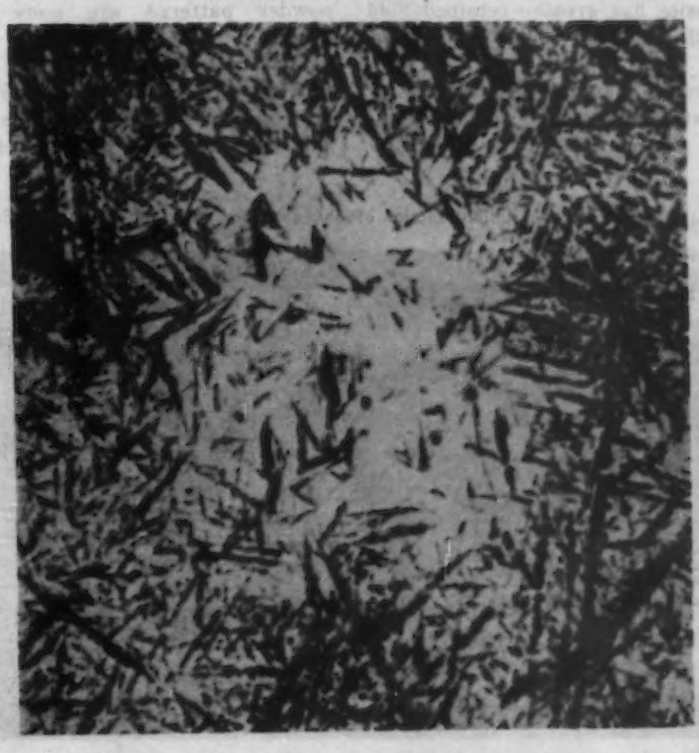
Both the "continuous" and "residual methods" of inspection were used. If the test piece is placed between the heads of the machine and the current flows through it while the medium* is applied, the method is called continuous. The duration of continuous current was simultaneous application of medium was 3 sec. In the residual method the piece is magnetized by a current flow of 1 sec, removed from the heads and immersed in the medium for 8 sec. After the powder patterns were formed, a rinse in clear Ultrasene was used to remove excess particles held by surface tension. Table I shows magnetic particle indications of segregation obtained in annealed pieces.

**The medium used was red iron paste developed by Magnaflux Corp. dissolved in Ultrasene (Atlantic Refining Co.) in the recommended proportions of 1.0 to 1.5 oz per gal.*

The data obtained on strength of indications of segregation and austenite in heat-treated specimens are shown in table II.

From table I, it is evident that the continuous method must be used with the annealed stock in order to obtain the desired indications. Powder pat-

FIG. 2—Segregation and austenite found in tool. Original magnification 250X. Etchant, 10 pct nital.



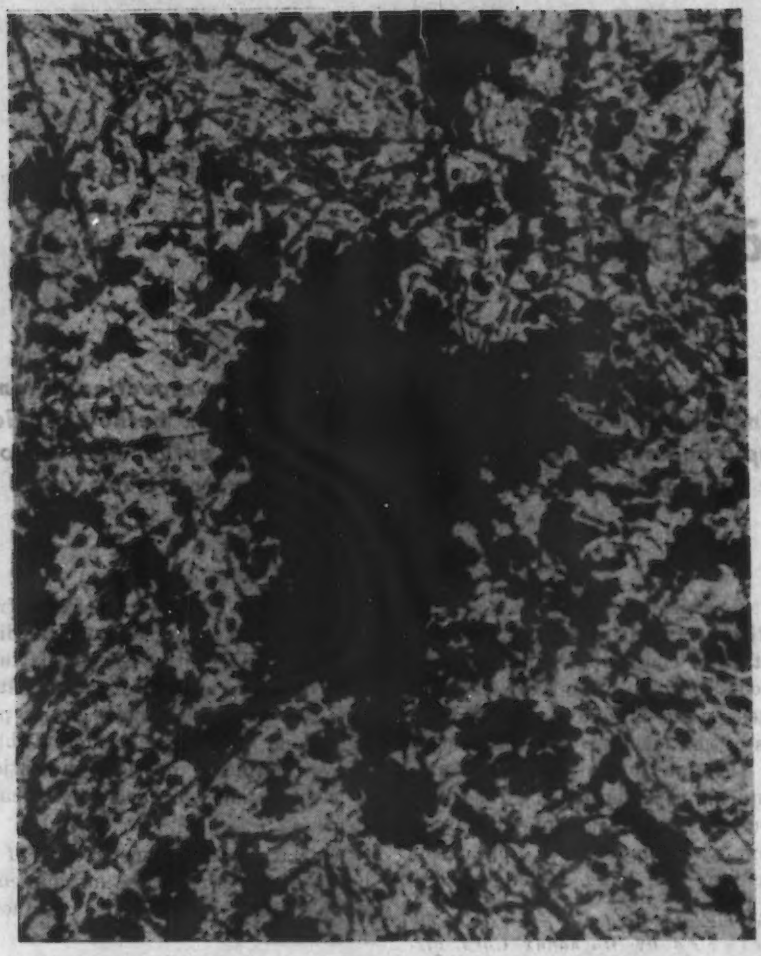


FIG. 3—Magnetic particle indications of the same area as in fig. 2.

terns of equal strength can be obtained on the heat-treated specimens by using lower amperage and the same technique. This is possible because after hardening, the matrix of martensite has greater retained field strength than the matrix of the annealed steel.

Magnetic particle indications of segregation observed on a longitudinal section are more pronounced than on a transverse. The elongated carbide stringers have a much greater area exposed when viewed lengthwise; therefore, interruptions in the magnetic field are more numerous and powder patterns are more easily formed.

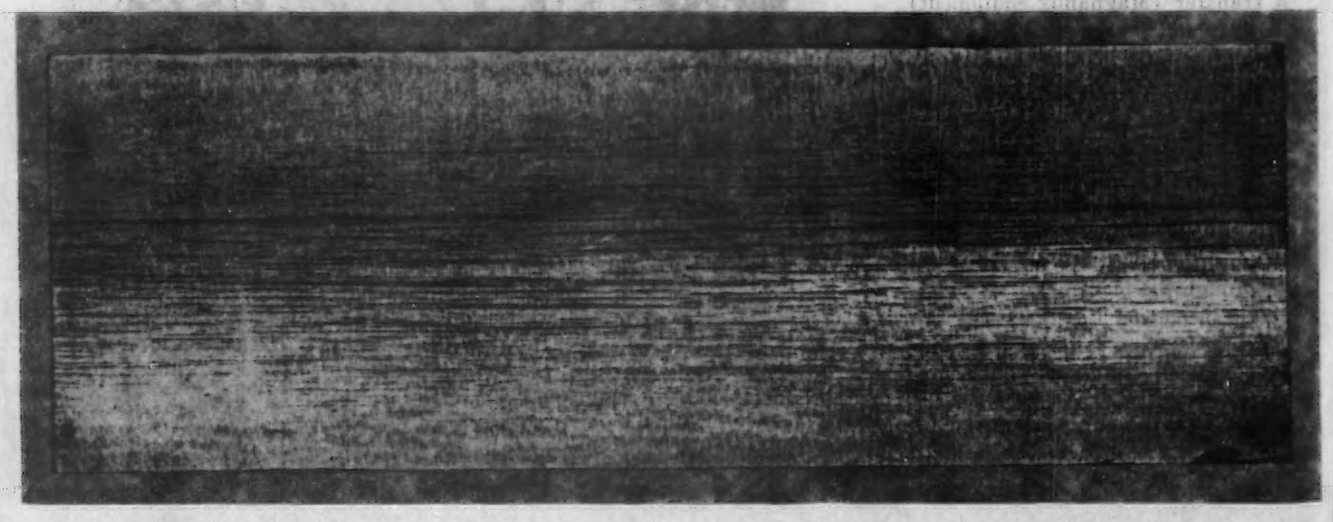
Surface conditions play an important part in obtaining proper magnetic particle results. On a saw-cut surface of either a transverse or longitudinal section, no clinging particles could be found in the segregated areas. By polishing on a No. 50 emery paper or surface grinding with a 36-05 BE Norton wheel, indications were strong and easily determined. Surfaces of finished tools have a fine polish and offer better conditions for testing.

Local poles have a tendency to be formed during magnetic inspection with high current densities if the contact areas are not large enough. When using the "wet-continuous procedure," particles gather in a fan shape at the contact points as the medium is applied over the piece. Current durations of more than 3 sec magnify this undesirable pattern and mask the true indications.

In order to make a positive study of the segregated carbides and austenitic areas, it was necessary to make a microscopic examination. The specimens were ground and polished, then etched with 10 pct nital. Segregations and austenitic patches were located and marked for later Magnaflux examination. Fig. 2 is a photomicrograph of a transverse section of a boring tool at 250 magnification after polishing and etching. Fig. 3 is a photomicrograph of the same area at the same magnifications after Magnaflux had been used. Fig. 3 reveals the qualitative nature of iron particle indications.

Measurements by means of an eye piece micrometer at low magnification showed that definite powder patterns will be found on nonmagnetic areas as small as 0.1 mm square in cross-section. The accuracy obtained and the ease with which the deter-

FIG. 4—Longitudinal section of annealed bar stock showing Magnaflux indications of segregation. Actual size.



minations are made, make Magnaflux something more than a "crack finding" instrument.

Having established the sensitivity of the method, the metallurgist is able to use the procedure for quality control of bar stock and tools. Fig. 4 is a longitudinal section of annealed bar stock prepared and tested as described, showing carbide segregation. The magnetic particle indications of this condition will be better than the results obtained by macroetching using 1:1 HCl at 170° F for 45 min. If further investigation is warranted, a metallographic examination at 100 X should be used.

A quality control of bar stock before making tools is important because cracks are likely to develop in heavily segregated areas during subsequent heat treatment. In fig. 5 note the white-banded appearance of segregation and the straightline crack running in the same direction as the stringers. Along the crack in the heavy carbide area, large amounts of austenite were formed during hardening and not broken down down by tempering. Because of this retained constituent, stresses are concentrated and cracking results.

Extensive Magnaflux indications of segregation and austenitic retention has a definite bearing upon tool life. Boring or cutting tools take the brunt of the work on the nose and cutting edges. The carbide stringers and the high amount of austenite retained with them lie in planes at right angles to the cutting edge. This has a definite stress-raising effect. If the tool is ground several times during its use, the tendency to crack across these planes is increased as the front edge is worn down. Actual fracturing may take place when a heavy chip is being taken. In drills, reamers and counterbores, the ends of the carbide segregates are present on cutting edges lying near the original bar-center. Chipping will occur when these areas are sufficiently large, and retained austenite is present to further soften these points.

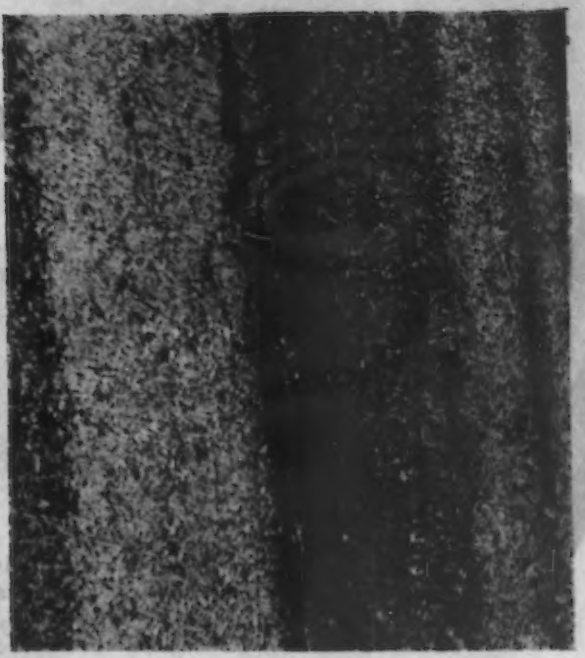


FIG. 5 — Longitudinal section at bar center at 100X, showing a crack in the heavily segregated area. Etched with 10 pct nital.

Summary

(1) Segregations and areas with retained austenite are found in high-speed tools by the magnetic particle method.

(2) Leakage fields around the magnetic matrix are weaker when interrupted by nonmagnetic constituents than when cracks were present. These areas are indicated more strongly when higher current densities are used than in the routine examination of pieces for cracks.

(3) Positive identification of segregates and austenite as the cause of magnetic particle patterns was determined by microscopic examination on hardened and etched specimens.

(4) Before making tools from high-speed bar stocks, inspection of longitudinal sections by the wet-continuous method provides a rapid and accurate indication of quality.

TABLE I
Annealed Conditions

AMPERES	INDICATIONS	
Continuous Method	Transverse Section	Longitudinal Section
200	None	None
500 to 700	None	Slight
900 to 1200	Slight	Good
1500 to 2000	Fair	Strong
Residual Method		
0 to 3000	None	None

TABLE II
Heat-Treated Conditions

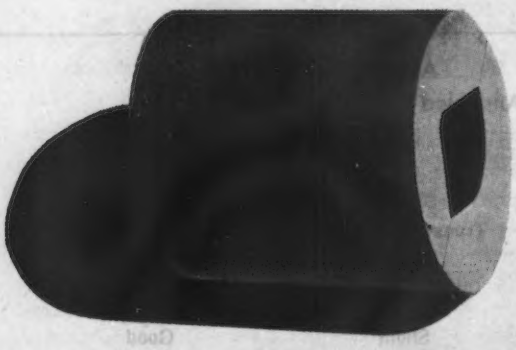
AMPERES	INDICATIONS	
Continuous Method	Transverse Section	Longitudinal Section
200	None	Slight
500 to 700	Slight	Fair
900 to 1200	Fair	Good
1500 to 2000	Good	Strong
Residual Method		
2000	Fair	Good
3000	Good	Strong

Sectional Carbide Molds Facilitate Recutting

PREFORMED sectional sintered carbide nibs.

THE production records achieved by sintered carbide tools and dies may now be duplicated by sectional carbide nib molds, according to Firth-Sterling Steel Co., McKeesport, Pa., at the conclusion of 6 years of experiments into this branch of powder metallurgy. This company is probably the largest producer of such preformed nibs, and also produces the steel casings and shanks for the molds and plungers. Carbide Die & Mold Co., Pittsburgh, is the first fabricator of the finished nibs and molds.

Specifically cited, is the case history of a plant engaged in pressing tungsten-silver electrical contacts. The tool steel molds originally used operated in connection with hydraulic presses exerting a presure of 40 tons per sq in. When this setup proved incapable of producing points tense enough to reduce burning, and when such molds had to be discarded after 12,000 or fewer compresses, the decision was made to shift to sectional carbide nibs and carbide-tipped plunger. Simultaneously the manufacturer stepped up the pressure from 40 tons to 60 tons and, then, to an unprecedented 70 tons.



LEFT

THE nib, now spotted, is ready for the grinding jig.

o o o

BELOW

GRINDING of the sectional nib to exact size is done with a diamond wheel on a surface grinder.

After 27,000 compresses had been achieved with the new setup, the copper brazing holding the carbide tip to the steel plunger failed. The manufacturer ordered a redesigned plunger of solid carbide, shrink-fitted into the steel shank. With this change, the mold continued in service from 27,000 to 124,000 units, at which time the mold was examined and was found to have worn less than 0.001 in. The plunger was redressed, 0.008 in. being removed from its head. The engineer on the job, after noting that the mold had worn less than 0.001 in., and that the tolerance permitted on these electrical contacts is 0.005 in., estimated that the mold should be good for 500,000 compresses before recutting would become necessary. The estimated number of recuts of this mold, based on the amount of carbide stock in the nibs, is reported to be five, which forecasts a production of 2,500,000 units during the complete life of the mold.

Regular operating test runs of the new type molds in other plants indicate that production of 500,000 pieces per cut are commonplace, Mr. Loach reports, adding that a substantial number of molds now in operation have been recut as many as five times, and that ten to twelve recuts would seem to be entirely practical in many

instances. Specifications governing the amount of stock in the original sintered carbide nibs in such molds is determined by the anticipated production, as the recutting has proved to be not only practical but economical.

The sectional nibs in existence are made of Firthite of a hardness determined by the metal powder to be compressed. The test applications to date have covered the following powdered metals: carbon, brass, bronze, copper, iron tungsten, and tungsten-silver. A substantial number of the new type molds also are being used in connection with pellet presses for compressing pharmaceutical powders.

Sintered carbide has proved its ability to resist compression loading with its compression strength of some 700,000 pounds per sq. in. Decision to shift from solid to sectional nibs followed the persistent observation that a sharp corner in a solid nib subjected to load doubles, triples or further multiplies the stress, depending upon the angle and sharpness of the corners. It was noted that under such repeated stress, the high local stresses at the corners caused fatigue failure by cracking and chipping. Recutting of solid nibs was only possible by hand, which was impractical. By comparison, the lapped seams in the sectional nibs achieved "controlled" cracks comparatively free of trouble and insuring full life for the mold. Sectional nibs, it is thought, will eventually make it possible for the user to finish his own molds.

The major advantage of the sectional as opposed to the solid nib, it is pointed out, is the fact that the nib may be recut and that the life of the mold is limited only by the amount of stock which is removed. Recutting to the original size is advantageous for both standard shapes and special shapes that call for long production runs, because worn molds are reclaimable. In addition to being recut to original size a sectional nib mold also may be recut to larger size within the limits of the nib diameter.

RIGHT

FITTING the plunger to the mold. Tolerance is 0.0003 in. on each side.

o o o

BELOW

HAND-LAPPING the mold with diamond powder.

▼ ▼ ▼

CLAIMED to be the largest diamond tool containing the largest industrial diamond ever used, a diamond grinding wheel dresser weighing 62.5 carats when placed in service Oct. 18, 1940, now weighs 19.20 carats. The dresser, manufactured by Diamond Tool Co., Chicago, yielded 8064 dressings for a 10.55 carat loss since its last resetting. The dresser was used by Northwestern Engineering Co. on a 24 in. diam by 3 in. face, Grade 401N27 Carborundum wheel on a Norton crankshaft grinder.

GAS CARBURIZING

. . . In the second part of this three-part article, the reactions of the various atmospheres used in the carburizing process are described in considerable detail. The control of soot precipitation and the physical and chemical factors involved in gas carburization are discussed.

o o o

By ERNEST S. KOPECKI
Lieutenant, U.S.N.R.

o o o

THE generally accepted theory of the mechanism of gas carburizing is represented by the reactions:

$$2CO + 3Fe \rightleftarrows Fe_3C + CO_2$$
$$CH_4 + 3Fe \rightleftarrows Fe_3C + 2H_2$$

This evidently does not represent the actual condition. At carburizing temperatures, Fe_3C is not formed as such, rather there is present carbon dissolved in gamma iron. This would therefore modify the above reactions as follows:

$$Fe + 2CO \rightleftarrows C_{(in\ \gamma\ Fe)} + CO_2$$
$$CH_4 + Fe \rightleftarrows C_{(in\ \gamma\ Fe)} + 2H_2$$

CARBON MONOXIDE: In contact with steel at carburizing temperature, carbon is given up to the steel surface and a decarburizing agent (carbon dioxide) is formed, as shown by the reaction:

$$Fe + 2CO \rightleftarrows C_{(in\ \gamma\ Fe)} + CO_2$$[10]

The reaction is reversible, and in order to continue the carburizing operation, sufficient CO concentration must be maintained to drive the reaction from left to right.[11] Carbon monoxide is a relatively feeble carburizing agent.[4]

The term "available carbon" is used to express the maximum amount of carbon in pounds that may be obtained from a given gas composition at a given temperature.

A commonly used gas used in commercial carburizing, 20 pct CO, 80 pct N_2, has relatively low available carbon. For a partial pressure of 0.2 atmosphere CO (which is about the common commercial usage), the carbon available for carburization can be readily determined.

For the carburizing reaction:

$$2CO + Fe \rightleftarrows C_{(in\ \gamma\ Fe)} + CO_2$$

and a temperature of 1700°F, the equilibrium constant can be determined by the relationship

$$^*\log K_P = -\frac{15{,}966}{T} + 9.960$$
$$= -\frac{15{,}966}{2160} + 9.060$$
$$= 1.668$$
$$K_P = 46.56$$
$$T = 1700°F + 460°F = 2160°F$$

*Based on the reactions:

$$C + O_2 = CO_2$$

FIG. 1—Equilibrium curves of the CO:CO_2 ratio. For any given temperature and any carbon content of the steel, there is a definite ratio of CO:CO_2 at which the carburizing and decarburizing tendencies are just balanced.

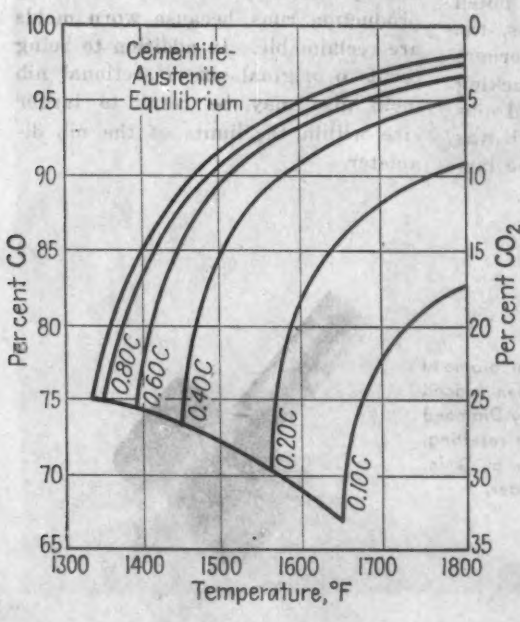


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FIG. 2—Available gases for carburizing. By mathematical computation, it is seen that 0.0337 lb carbon per cu ft natural gas is available for carburizing at 1700 °F, shown by point b above. This is about 1200 times the amount for an equivalent volume of generator gas, as shown by point c.

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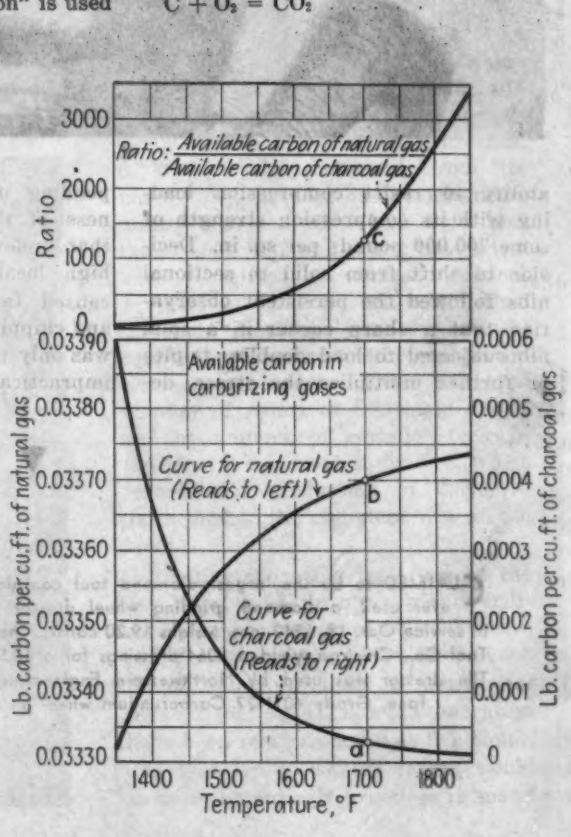


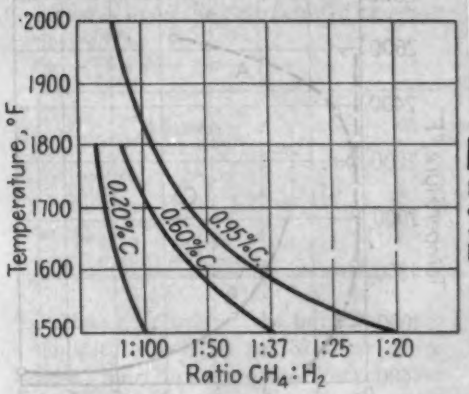
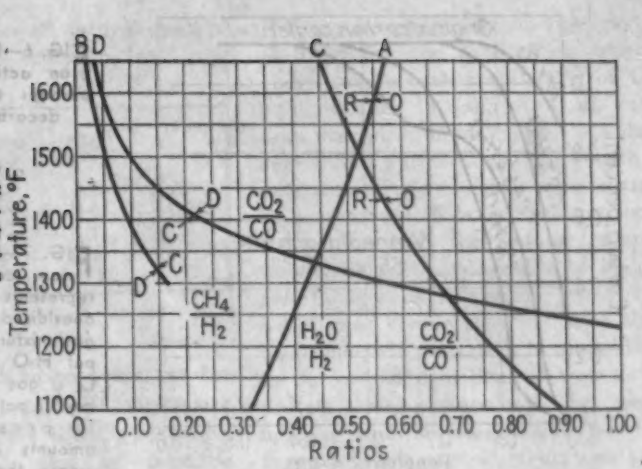


FIG. 3—The CH_4:H_2 equilibrium curves show that a very small CH_4:H_2 ratio will be in equilibrium with a high carbon steel at carburizing temperature. A composition to the right of a curve is carburizing to the steel represented by that curve; a composition to the left is decarburizing.



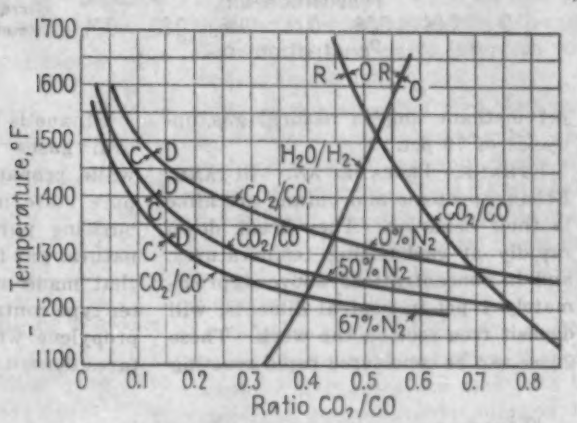


FIG. 4a—Variation of the CO_2:CO ratio at equilibrium when the CO-CO_2 atmosphere is diluted with nitrogen.

RIGHT

FIG. 4—Equilibrium ratios for the CH_4:H_2 and CO_2:CO reactions in contact with iron-carbon alloys saturated with carbon.

$$\log K_P = -\frac{37{,}098}{T} - 0.018$$

$$C + \tfrac{1}{2}O_2 = CO \quad . \quad . \quad . \quad .$$

$$\log K_P = -\frac{10{,}556}{T} - 4{,}539$$

Simplifying:

$$2CO = CO_2 + C \quad . \quad . \quad .$$

$$\log K_P = -\frac{15{,}966}{T} + 9.060$$

The equilibrium constant is also related to the partial pressures of CO and CO_2 by:

$$K_P = \frac{p^2_{co}}{p_{co^2}}$$

Since the volume of the active gas equals unity, that is, $CO + CO_2 = 1$, let $CO = x$ and $CO_2 = 1 - x$.

Therefore, since the partial pressure $P = 0.2$ atmosphere,

$$K_P = \frac{P.\,p^2_{co}}{p_{co_2}} = \frac{P.\,(x)^2}{1-x}$$

$$\frac{x^2}{1-x} = \frac{K_p}{P} = \frac{46.56}{0.2} = 232.8$$

where

$$x = 0.9957$$

$$1 - x = 0.0043$$

Thus, of the total carbon in 0.2 lb mol, which is 0.2 x 12 or 2.4 lb, only 0.43 pct is available for carburization; the rest is locked up in gaseous compounds in a system in equilibrium. Since at 60°F, 1 lb-mol occupies 380 cu ft, the weight of available carbon in 1 cu ft of 20 pct CO gas is

$$\frac{2.4 \times 0.0043}{380} = 0.0000272 \text{ lb}$$

This is plotted as point *a* in fig. 2.[12]

For CO to be an effective carburizing agent, high rates of flow must be used.[23] It can also be used as a diluent gas for the heavier hydrocarbons.[24]

For any given temperature and any carbon content of the steel, there is a definite ratio of CO:CO_2 at which the carburizing and decarburizing tendencies are just balanced in fig 1. At 1750°F, about 98 parts of CO to 2 parts CO_2 are required to keep the gas mixture slightly carburizing to high-carbon steel.[24]

Fig. 1 shows, for example, that when sufficient time has been allowed for equilibrium, a 90 pct CO, 10 pct CO_2 gas at 1500°F will carburize a low-carbon steel up to 0.80 pct carbon, but no higher; at 1600°F this gas would carburize it only to 0.40 pct carbon.

METHANE: Methane carburizes according to the following reaction:[10]

$$CH_4 + Fe \rightleftarrows C_{(in\ \gamma\ Fe)} + 2H_2$$

This reaction is also reversible, and the CH_4 concentration must be maintained high enough to drive the equation from left to right.

Methane is a potent carburizing agent as can be shown by computation similar to that made for CO. From the relationship:

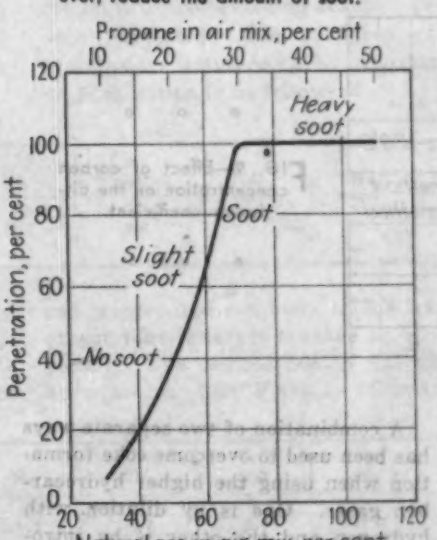
$$\log K_P = \frac{8370}{T} - 5.770,$$

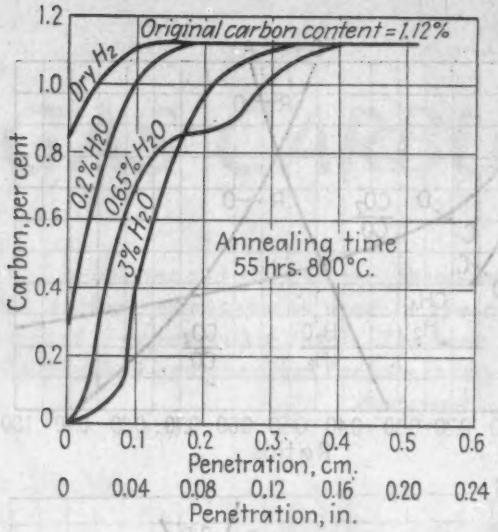
it can be shown that 0.0337 lb carbon per cu ft natural gas is available for carburizing at 1700°F. This is shown by point b, in fig. 2, and is about 1200 times the amount for an equivalent volume of generator gas, as shown by point c in fig. 2.[12]

This is corroborated by CH_4:H_2 equilibrium curves shown in fig. 3,[11] in that a very small CH_4:H_2 ratio will be in equilibrium with a high carbon steel at carburizing temperature. In the figure, a composition to the right of a curve is carburizing to the steel represented by that curve; a composition to the left is decarburizing. Fig. 4[25] shows a comparison between carburizing power of methane as compared with carbon monoxide.

City gas usually contains 25 to 50

FIG. 5—A mixture containing over 40 pct air has reduced carburizing potency. Smaller air additions, however, reduce the amount of soot.





LEFT

FIG. 6—Moist hydrogen is an active decarburizer, perhaps the most active decarburizer known.

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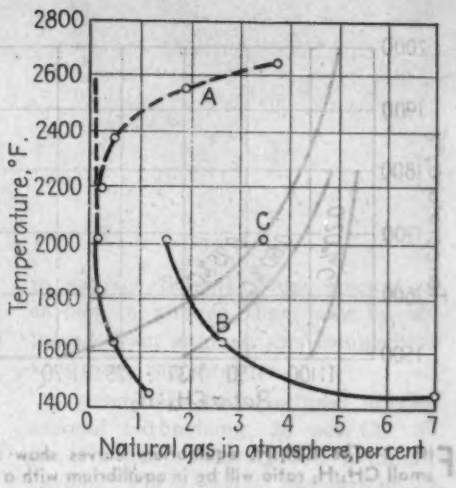
FIG. 7—Methane equilibrium curves. Curve A represents a gas mixture deoxidized and dried; B, a gas mixture containing 0.6 pct H_2O by volume, and C, a gas mixture containing 3.3 pct H_2O by volume. The presence of small amounts of moisture increase the percentage of methane required to maintain equilibrium.



pct methane and in natural gas upwards of 70 pct.[1]

ETHANE, PROPANE AND BUTANE: Ethane, propane and butane are alike in their behavior. They break down rapidly at carburizing temperatures, and in concentrations above approximately 1 pct in neutral diluents, will deposit free soot on the work. These gases can be considered rapid-reacting gases carrying only a moderate amount of available carbon per unit of volume when mixed with neutral diluents in the proportions for best carburizing.[34]

Ethane is present in almost all natural gases in varying percentages, while propane is available in a very pure state in liquid form. For carburizing purposes, propane from the natural gas fields is to be preferred to that made at oil refineries. The latter type contains a high percentage of propylene which in certain gas mixtures deposits coke.[34]

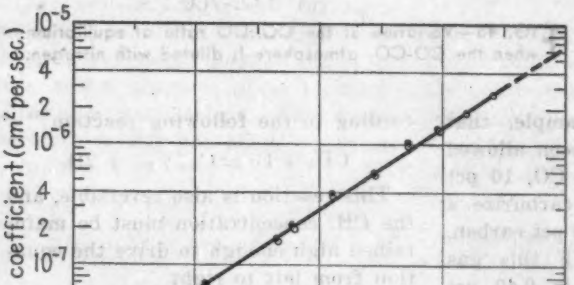


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FIG. 8—Diffusion coefficient D plotted on a logarithm scale against $\frac{1}{T}$. The diffusion coefficient increases quite rapidly as the temperature increases.

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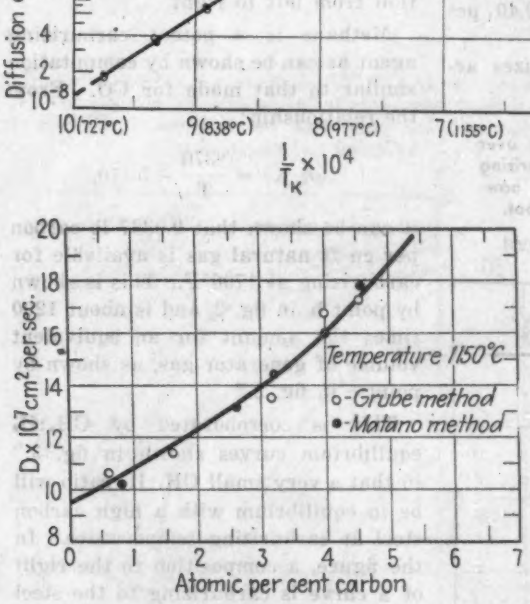

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FIG. 9—Effect of carbon concentration on the diffusion coefficient.

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A combination of two separate ways has been used to overcome coke formation when using the higher hydrocarbon gases. One is by dilution with hydrogen and the other is by introducing most of the hydrocarbon gas into the high temperature zone of the muffle. The high hydrogen diluent lowers the tendency toward tar formation by retarding polymerization (a chemical change resulting in the formation of a new compound whose molecular weight is a multiple of that of the original substance—a reaction involving a successive addition of a large number of relatively small molecules to form the final compound or polymer) and bringing about at high temperature pyrolysis (thermal decomposition) of the hydrocarbon into hydrogen and carbon that is free from the objectionable features. By introducing most of the gas into the high-temperature region, the thermal breakdown is so rapid that the unsaturated hydrocarbons are unable to persist and the lower and more stable saturated series bring about carburization without these interfering reactions.[35]

NATURAL GAS: Natural gas may be used either raw or diluted. From any one source it has the advantage of being unusually constant in total hydrocarbon content and the disadvantage, if used in the raw state, of depositing excessive amounts of soot on the work and retort unless carefully handled.[36]

In rotary machines and vertical furnaces, natural gas is usually diluted by mixing with air in a mixing machine such as the Selas mixer. For box-type batch operation or continuous furnaces, a DX unit is used to prepare burned gas of constant composition from natural gas. In this unit, practically perfect combustion of the air and natural gas occurs and a flue gas of almost any desired composition can be produced. The proportion of raw gas to DX gas (8 pct CO, 9 pct H_2, 4.5 pct CO_2, remainder N_2) used

depen's upon the character of the case desired.[35]

Typical analyses of natural gas are given in the table below.[34]

Location	CO_2	O_2	Illuminates	CO	CH_4	C_2H_6	N_2
Cleveland	...	0.2	0.2	0.8	80.7	18.0	0.5
Detroit	0.1	0.4	...	...	76.0	14.0	9.5
Pittsburgh	...	...	...	...	83.4	15.8	0.8
Canton, Ohio	...	1.2	0.8	1.0	79.2	16.1	1.7
Columbus	...	0.2	...	0.8	80.7	17.0	1.5

Hydrocarbons of the paraffin series constitute over 95 pct of these gases and, therefore, provide very active carbonaceous atmospheres. The stability of the paraffin series decreases with increasing molecular weight, methane being a decomposition product. Methane in turn, decomposes slowly to an equilibrium between CH_4, H_2 and C.[4]

Natural gas is to be preferred for gas carburizing because of its relative purity and because the high content of the sluggish reacting methane makes the gas easy to control.[34]

CITY GAS: Typical analyses of city gas are as follows:

Location	CO_2	O_2	N_2	CO	H_2	CH_4	Unsaturates
Toledo	2.8	0.3	3.3	8.4	48.1	33.1	4.0
Syracuse	3.0	0.6	5.6	12.1	44.6	29.8	4.3

THERE are great variations in analysis from day to day depending on demand, the gas being modified by additions to produce a standard heating value.[4, 36] The gas is very rarely used for carburizing purposes, but in some instances, weakly carburizing city gases has been enriched by saturation with hydrocarbons, the gas being bubbled through benzene or a similarly mildly volatile liquid,[36] or the addition may be made by injection into the gas stream.

LIQUID HYDROCARBONS: Atmospheres may be prepared by volatilization of such hydrocarbons as dipentene and aniline. The liquid is usually admitted to the carburizing chamber in controlled quantity. The soot-forming tendency of these heavier hydrocarbons is great, but if artificial turbulence by a fan is produced, the excess of available carbon introduced need not be great, and soot deposit may be held to a harmless amount.[4]

Lowe reported the use of hydrocarbon liquids by dripping the liquid into the chamber containing the hot charge, volatilizing the liquid. The resulting gas is forced through the charge by a fan. The majority of the cracking of the hydrocarbon is done on the charge to be carburized; thus use is made of nascent carbon. The fan also recirculates part of the cracked gas, thereby diluting the rich incoming gas and preventing the formation of soot.[37]

PREPARED ATMOSPHERES: A commercially prepared atmosphere called RX gas is used for carburizing. This gas is prepared by cracking a noncombustible mixture of air and gas in contact with a catalyst at high temperatures. The gases are quickly chilled after the cracking reaction has been completed. The prepared gas contains no water or carbon dioxide; its composition is as follows:[38]

O_2	CO_2	CO	H_2	CH_4	H_2O	N_2
0	0	20.7	38.7	0.8	0	39.8

THIS gas is becoming increasingly popular for bright carburizing. Another prepared atmosphere, CG gas is used in bright carburizing. This gas is prepared similarly to RX gas, except that it is not cracked as completely. The composition of CG gas (produced at 1800°F) is as follows:[38]

O_2	CO_2	CO	H_2	CH_4	H_2O	N_2
0	0.2	20.5	36.0	3.8	0.5	39.0

IF an excess of carbon-rich gas is used for the carburizing atmosphere, excess carbon will form on the work surface in solid form as soot. Soot precipitation may occur to such a degree that a dense, coke-like sheath is produced, firm and continuous enough to be removed in large sections from the work. It is the popular opinion that some soot is desirable to insure satisfactory carburization, with the belief that visible soot indicates that the carburizing reaction is proceeding in the proper direction, as well as to protect the surface of the work against oxidation on removal from the furnace,[39] but may, if it accumulates in sufficient quantity, so block the surface of the steel as to interfere with carbon absorption.[4]

Wyzalek states that soot formation on the work is less objectionable when carburization is accomplished with work in motion, thus continually breaking up the soot surface, as is the case in revolving horizontal retort furnaces, than when the work is stationery.[39]

To control the carbon content of the case and eliminate formation of excess soot, diluting gases are used with the object of controlling by dilution the rate at which carbon is liberated from the hydrocarbon source of carbon.[4] The effect of a diluting gas, N_2, is shown in fig. 4a.[20]

NITROGEN: Williams states that atmospheric nitrogen apparently does not enter into any of the reactions of carburizing.[34] Experiments carried out by Williams using pure nitrogen mixed with natural gas showed no variation until the percentage became high enough to dilute the medium to too great an extent. As shown in fig. 5, it will be noted that a mixture containing over 40 pct air has reduced carburizing potency, although soot is somewhat decreased by smaller air additions.[4] In fig. 5 is also shown a curve obtained by McQuaid for propane diluted with air, which is a patented process.[21]

HYDROGEN: Pure dry hydrogen is considered a slow decarburizing agent.[33] To decarburize, hydrogen must combine with carbon according to the reaction:

$$2H_2 + C_{(in\ \gamma\ Fe)} \rightleftarrows CH_4$$

Since 2 to 3 pct methane in a gaseous mixture prevents this reaction from proceeding, it is nonexistent in all gas carburizing.[34]

On the other hand, moist hydrogen is an active decarburizer as shown by fig. 6.[33] Jominy states that it is the most active decarburizer known.[33]

Sykes has investigated the carburiz-

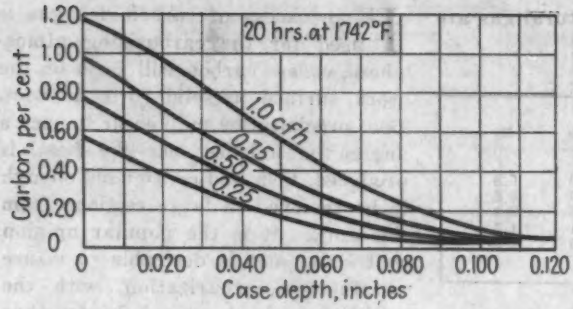


FIG. 10—Effect of the rate of gas flow on carburizing. This rate must be sufficient to supply the desired amount of carbon to the steel.

ing and decarburizing equilibrium for hydrogen and methane on 0.18 pct carbon steel, using natural gas of 80 pct methane content, as the source of methane. He also studied the effect on the equilibrium of increasing amounts of moisture. As shown on fig. 7, the presence of small amounts of moisture increase the percentage of methane required to maintain equilibrium.[23]

OXYGEN: Oxygen is a powerful decarburizer in accordance with the reaction:

$$C_{(in\ \gamma\ Fe)} + 2O_2 = CO_2 + 2O_{(in\ \gamma\ Fe)}$$ [13]

CARBON DIOXIDE: Carbon dioxide is an active decarburizing agent.[4] It decarburizes according to the reaction:

$$CO_2 + C_{(in\ \gamma\ Fe)} \rightleftarrows 2CO$$

While vigorous media with high available carbon (previously defined) can apparently tolerate a large percentage of carbon dioxide, its presence in dilute media is definitely damaging.[4] For example, active carburizing is obtained from 1 pct propane in neutral diluents, whereas concentrations of this same gas up to 30 pct in the mixture fed to a furnace, have been found necessary to produce an equivalent result when the diluting media contained approximately 2 to 3 pct water vapor and carbon dioxide.[24]

Reduction in soot and consequent assurance of maximum carburizing by use of carbon dioxide as a diluent has been disclosed by Brower.[24] However, the absence of an economical source of carbon dioxide renders this method of scientific interest only.[4]

WATER VAPOR: Water vapor is also an active decarburizing media, although contradictory experiences have been reported. Bramley found that dehydrated CO gave considerably greater carburization than CO bubbled through water,[25] while Guthrie found dry city gas to be inferior to gas with a definitely controlled H_2O content. Williams could find no difference in carburization with natural gas—flue gas mixtures with dew point of 15 and 85°F, nor with natural gas dry and saturated with H_2O at room temperature. Here, as with CO_2 the tolerance of natural gas is apparently great, for H_2O has been found very damaging in working with dilute media of reduced carburizing activity.[4]

On the other hand, Jominy has shown that saturated steam alone is not as decarburizing as smaller amounts of water vapor with hydrogen or nitrogen.[23]

FLUE GAS: The general term flue gas is used to cover media prepared by partial or complete combustion of heating gas under controlled conditions, resulting in a medium containing largely N_2, with H_2O, CO, CO_2 and H_2 present in amount determined by the mixture burnt. Such a gas by itself is usually oxidizing at carburizing temperatures due to the high moisture and CO_2 content. As the percentage of flue gas is increased, the richness of the medium is decreased, and lower maximum carbon content will be produced.[4]

CHARCOAL TREATED GAS: Commercial use has recently been made of diluent prepared by passing flue-gas mixtures over heated charcoal, producing a gas of 25 to 30 pct CO, equivalent H_2, and high N_2, with but traces of CO_2 and H_2O. This, it will be noted, is based on the water-gas reaction by which steam, passed over hot coke, reacts to give a gas largely CO and H_2. The diluent prepared in this manner, containing practically no decarburizing and oxidizing CO_2 and H_2O, should and does make a very satisfactory carrier medium.

Since the amount of what may be called anti-carburizing gases, that is, CO_2 and H_2O, is small, large excesses of carburizing agents to counteract are unnecessary, and the medium can be run close to the desired equilibrium analysis. Thus high or low-carbon cases may be produced with minimum soot deposition, only sufficient active gas being used to produce the desired available carbon. The percentage of active gas required is obviously lower than when the diluent contains CO_2 or H_2O which tend to reverse the desired reactions. Carburizing has been performed by such gases with complete absence of soot formation.[4]

DISSOCIATED AMMONIA: C. R. Austin has presented data on carburization in atmospheres of butane diluted with high percentages of dissociated ammonia. This diluent was prepared in a unit giving an output high in dissociation products of ammonia, that is 75 pct H_2 and 25 pct N_2.[25] According to Williams, no commercial application of this work has been made to carburizing, but he believes that this diluent should be useful for carburizing media of controlled activity to give selected maximum carbon contents, since it is free from oxidizing and decarburizing constituents.[23]

Dow reports that the most nearly perfect diluent gas he has found is the partially spent, decarburizing-agent-free, but still methane-rich, gas which comes from the muffle of a gas carburizing furnace. This gas need only be slightly enriched by additional hydrocarbon and returned to the furnace.[4]

Gas carburizing depends on the ability of the carburizing medium to supply atomic carbon to the metal surface. The carbon is absorbed at

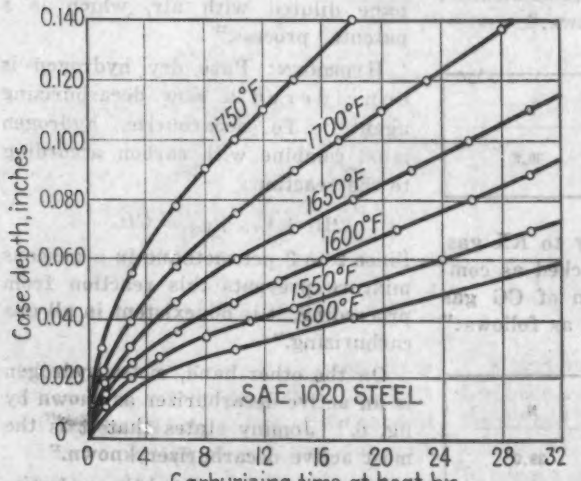


FIG. 11—Time-temperature-penetration curves after Schlumpf. It can be seen that increasing the temperature acts to increase the rate of carburization.

the steel surface and diffused into the work. The rate of diffusion depends on temperature, carbon concentration gradient and the factor of diffusivity (diffusion coefficient) for the particular steel in use.

This diffusion phenomenon is based on Fick's Law (1st form)

$$\frac{dm}{dt} = A.D.\frac{dc}{dx} \qquad A\ (area) = 1$$

where $\frac{dm}{dt}$ is the rate of diffusion of carbon into the steel, D is the diffusion coefficient, and $\frac{dc}{dx}$ is the carbon concentration gradient between the surface and the core of the steel.

The diffusion coefficient increases quite rapidly as the temperature increases, as shown by fig. 8.[9]

The diffusion coefficient of carbon in gamma iron increases regularly as the carbon concentration is increased, the rate of increase being somewhat higher at the higher concentrations, as shown by fig. 9.[9]

Harris conducted carburizing experiments on SAE 1020 steel and calculated the diffusion rate in terms of the carbon concentration at the surface of the steel.[28] His calculated values for the diffusion coefficient (the amount of substance diffused in unit time across a unit area through a unit concentration gradient) agree very closely with the calculations of Wells and Mehl.[9] The latter conducted diffusion experiments using steel specimens of different carbon contents welded together and diffusion-annealed.

The coefficient of diffusion does not vary with grain size in the range of ASTM Nos. 3 to 8, which includes practically all of the grain sizes encountered in plain carbon and alloy steels.[9] The rate of diffusion does not vary with impurities ordinarily present in commercial steels. Oxygen dissolved in gamma iron, even to saturation, does not appreciably change the rate of diffusion of carbon.[9]

Schlumpf remarks that the noncarbide forming alloying elements tend to retard the progress of carburization by impeding both (1) the surface carbon build-up and (2) the diffusion action.[30] Harris corroborates the first statement, stating that nickel and silicon in particular lower the surface carbon concentration (at a given temperature).[29] Wells and Mehl, in contradiction to Schlumpf's second statement, have found that the effect of manganese up to 2.5 pct and nickel up to 2.0 pct on diffusion, is negligible.[9] The elements that are strong carbide formers, according to Schlumpf, tend to increase the surface carbon concentration and the rate of carburization.[30] This is plausible in that the alloys will absorb additional carbon to form alloy carbides and in so doing increase the carbon concentration gradient.

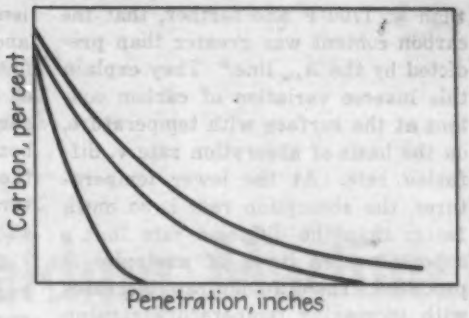


FIG. 12—Typical carbon penetration curves. To eliminate peeling or chipping between case and core, the carbon gradient should be gradual.

The rate of flow of carburizing gas over a metal surface must be sufficient to supply the desired amount of carbon to the steel. The results obtained by varying the flow of the gas is shown in fig. 10.[28]

Cowan conducted corresponding velocity tests using propane as the carburizing medium and found that there was an optimum rate of gas flow which gave the best carburizing results.[15]

Too low a volume of carburizing gas results in shallow depth of case, while too slow a movement of the gas results in a nonuniform depth of case. On the other hand, increasing the flow beyond a satisfactory maximum results apparently in pronounced turbulence of carburizing gas in the muffle. This creates nonuniformity both in depth and character of case and at the same time produces a carbon deposit on the product with a tendency toward coking, resulting in soft spots on the quenched work.[31] Increasing the rate of carburization can also be accomplished by increasing the temperature, as illustrated in fig. 11 (prepared from test runs in a production vertical stationary type gas retort using natural gas at atmospheric pressure). These curves approximate closely the carburization rates obtainable regardless of the gaseous medium used.[30]

Great stress is laid on avoiding a sharp line of demarcation between case and core, that is the carbon-penetration curve should not be steep. Such a curve makes the case liable to peeling or chipping on that line, a phenomenon called enfoliation or exfoliation.[11] Fig. 12 shows typical carbon-penetration curves.[10]

It may be that the surface carbon concentration obtained is higher than desirable. To change the carbon concentration gradient, a diffusion period may be added to the carburizing period, all in the same cycle. The flow of natural gas is stopped, and the diffusion cycle proceeds in an atmosphere of weak charcoal gas, which has no carburizing power and which protects the work from decarburization. Thus the carbon is allowed to diffuse inward to the desired extent without building up excess carbon at the surface.[28]

It has been established that in carburizing, the penetration varies directly with the square root of time elapsed after the steel has reached the carburizing temperature, and the condition of maximum carbon at the surface has been attained.[10] The relation of time to carbon penetration (case depth) is illustrated in fig. 13, which represents actual concentration-depth curves for carburizing 1-in. bars of SAE 1020 steel, withdrawn after 2.3, 4.3, 6.3 and 8.3 hr at 1700°F respectively and air cooled.[32]

Boegehold and Tobin report tests made that show the outer case to contain higher carbon content at 1500°F

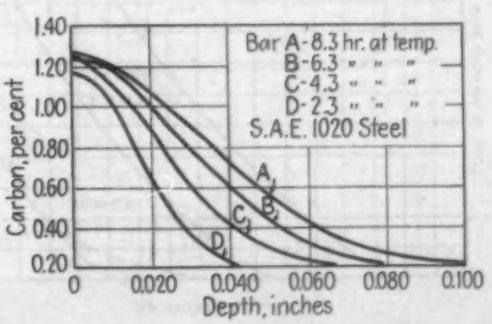


FIG. 13—Actual carbon penetration gradients for carburizing 1-in. bars of SAE 1020 steel, withdrawn after 2.3, 4.3, 6.3 and 8.3 hr at 1700° F and air cooled.

than at 1700°F and further, that the carbon content was greater than predicted by the A_{cm} line.[32] They explain this inverse variation of carbon content at the surface with temperature, on the basis of absorption rate v. diffusion rate. At the lower temperatures, the absorption rate is so much faster than the diffusion rate that a supersaturated layer of austenite is produced. The diffusion rate increases with increasing temperature causing the surface carbon to decrease steadily until finally a point is reached at very high temperatures where the diffusion rate is fast enough to prevent the formation of a saturated austenite at the surface.[33]

Harris challenges this hypothesis and reports that at the Buick Motor Div., carbon contents at the surface of carburized samples come fairly close to the amounts called for by the A_{cm} line of the equilibrium diagram, modified according to alloy content. To bear this out, fig. 14 (shown in Part III) shows the results of carburizing various steels with a steady flow of a controlled mixture of 8 parts of natural gas, analyzing 79 pct Ch_4, 8 pct C_2H_6, 4 pct C_3H_8 and 9 pct N_2 and 55 parts of dryco-lene, analyzing 22.7 pct CO, 2.2 pct H_2 and 75.1 pct N_2 (0.0 pct CO_2). The figure indicates what would be expected on theoretical grounds, that is the saturated austenite contains more carbon as the temperature increased, and the carbon at any particular temperature is no greater than called for by the A_{cm} line.[34]

Harris suggests that deposition of hard coke on the steel surface, (due to gas mixtures far from equilibrium) or surface carbides which are quite complex as found in alloy steels, may produce the results as shown by Boegehold and Tobin. He goes on to say that from a straight diffusion standpoint, it is difficult to postulate any movement of carbon from the steel surface to build up a concentration above that percentage of carbon which is soluble in austenite at the given temperature.[34] Dow states that increases in carbon concentration beyond this point result in increasing free carbon (soot) deposit[14] It is possible that fluctuations in temperature, at the carburizing temperature may increase the surface carbon content over that called for by the A_{cm} line. The upper limit would tend to absorb more carbon while the lower limit would cause formation of excess Fe_3C.

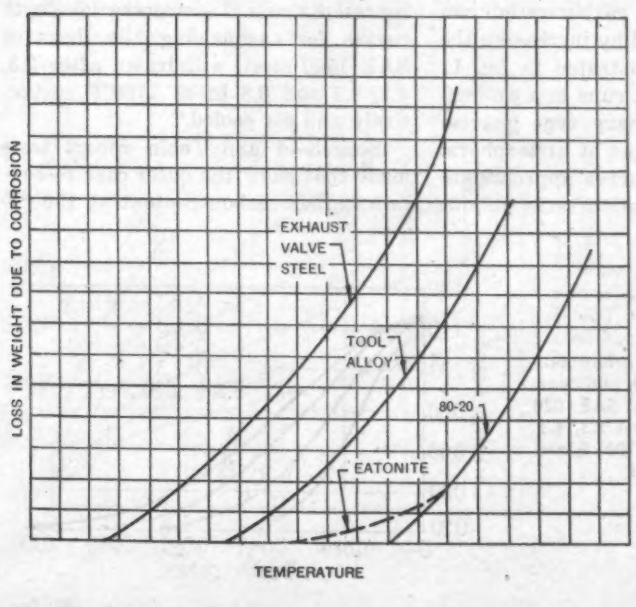
Breibart[35] theorizes that the carbon contents called for by the A_{cm} line, modified according to alloy content, will be obtained when the steel is homogeneous austenite during carburization. In other words, the presence of undissolved carbides during carburization results in further carbide precipitation and in growth of the carbides. Consequently, the carbon content exceeds the amount called for by the equilibrium diagram.

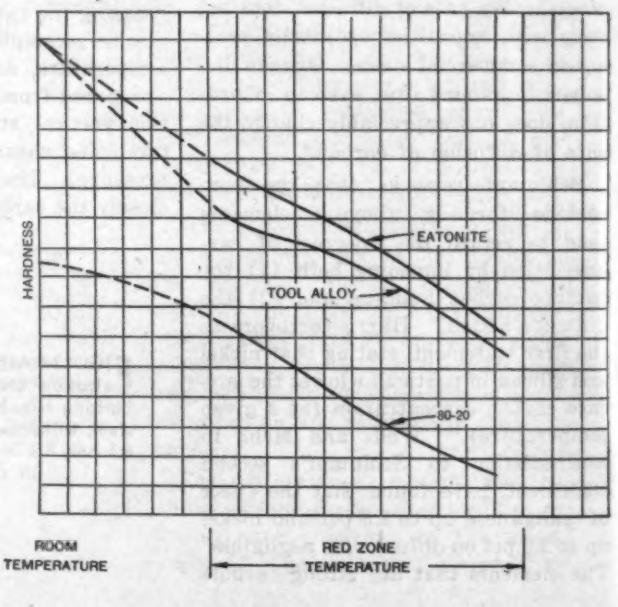
Catalysis seems to be a factor in carburization, but it is not thoroughly understood. Cowan has reported that the use of oxidized trays or of material covered with mill scale accelerates the carburizing rate.[15] This report led Williams to experiment with the effects of scale on carburizing rates; he found no variation when carburizing specimens scaled at one end and unscaled at the other.[15] Wyzalek found that the presence of rust of any nature upset the balance in the furnace and caused nonuniformity in the case.[21] However, McQuaid,[36] Schlumpf,[30] and Rozner[37] have reported the same effects as Cowan.

Ed. Note—Next week this series will be concluded with a discussion of bright carburizing, skin recovery, heat treatment of carburized parts and equipment.

New Valve Facing Alloy

THE trend toward higher compression engines necessitated the development of valves that resist corrosion and retain their shape and hardness. These two qualities had to be combined in a single metal or alloy. After a long search for such an alloy, technicians of the Wilcox-Rich Div., Eaton Mfg. Co., Detroit, discovered the alloy Eatonite which they say is outstanding in its resistance to corrosion, losing only 10.5 pct of the immersed section, compared to 19 pct for the next best and 100 pct, or complete loss, for another valve material. The loss in weight due to corrosion is greater at high temperature, with Eatonite duplicating the performance of 80-20 in the red zone above 1000° F and that the new alloy has approximately the same hardness as tool alloy at room temperature but retains its hardness better in the red zone and is superior to 80-20 as shown below.





Electrical Characteristics Of Spot Welding Machines

. . . Efforts to improve the strength, consistency of results and quality of spot welds have in the past overlooked the importance of throat dimensions. The results of tests reported herein show that an increase in welding current of 76 pct, representing an increase in welding heat of 320 pct, is obtained by using the machine at its minimum throat as against maximum throat.

o o o

By C. L. RAILTON
and
A. J. HIPPERSON

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IT is now an accepted fact that the true measure of the welding capacity of a spot welding machine, insofar as the electrical characteristics are concerned, is the maximum possible secondary current which the machine can deliver at the weld, at the required duty cycle. It was the principal object of a series of investigations reported in *Sheet Metal Industries*, London, to determine to what extent the secondary current of a spot welder is affected by various conditions of the secondary loop, that is, by throat depth and throat opening, and by the amount of magnetic material in the throat.

The first series of tests was carried out in order to investigate the primary and secondary current for each tapping on the transformer, varying in turn both the throat depth and the throat opening. The throat depth was first adjusted to the maximum possible dimensions allowed by the standard arms and electrode shank clamps. The throat depth was measured from the center-line of the electrode shanks to the facing plate near the secondary of the welding transformer proper. The throat opening was adjusted in a similar way, to the maximum possible. Secondary current and primary current were then measured under short circuit conditions (that is, no material between the electrode tips) on all 10 taps of the welding transformer. Maintaining the same throat opening, three or four more sets of readings were taken in a similar way, decreasing in steps the throat depth, down to and including the minimum throat depth. Similar sets of readings were taken for various values of throat opening, so that the final test figures covered fairly comprehensively a wide combination of throat depths and openings, from the minimum to the maximum possible.

From the results of the foregoing tests, tabulated in tables I, II, III and IV, graphs were plotted of measured secondary current against throat depths, at various throat openings. These are shown in figs. 2 to 4 inclusive. Figs. 5 and 6 show the relation between secondary current and throat opening, at the minimum and maximum throat depths used in the tests. It can be seen that secondary current at a given tapping decreases substantially with increase in throat depth and throat opening. Although the measured distances for throat depth and opening have been chosen between arbitrary points as shown in fig. 1, an increase in either of these dimensions does mean a corresponding linear increase in throat area, the actual throat area being the product of these two dimensions plus the area contained in recesses in the flexibles which are drawn to scale in fig. 1. In most cases, straight lines have been drawn through the plotted points, although in actual fact the curves are probably small parts of curves which

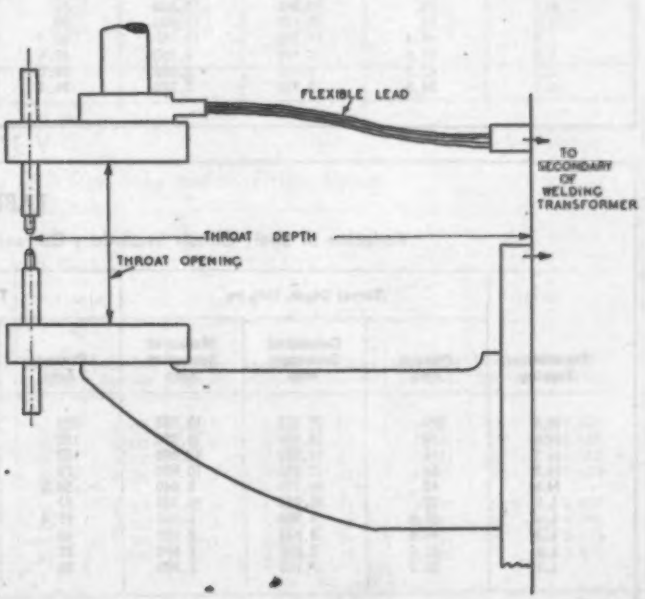

FIG. 1 — Arrangement of secondary loop of welding machine.

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become asymptotic to the throat dimension axis.

The second series of tests was carried out in order to determine the effect of varying amounts of steel introduced into the secondary loop. For all these tests, throat depth and throat opening were kept at a constant value. First, the primary and secondary currents were measured on each transformer tapping under secondary short circuit conditions. Then a tube, 5¼ in. OD and 14 Swg wall thickness was slipped over the lower arm so that it was projecting into the throat a distance of only half the tip diameter, and another set of primary and secondary current measurements were taken. The tube was fed into the throat an additional 4 in., and the readings taken again. The tube was then inserted for distances of 8, 12 and 16 in. respectively and similar readings taken at each of these distances. It should be noted that for these experiments, a special lower electrode assembly was used, and consisted of a 3 in. diam round arm with an inclined tip as shown in fig. 7. It was not considered necessary to make actual spot welds in these tests, but merely to pass the current through the single thickness.

The experiments on the effect of the tube inserted into the throat of the machine on secondary current were supplemented by similar tests on flat sheet. Results tabulated in table V show that sheet gave very similar readings as did the tube experiments.

TABLE I

Measured Open Circuit Secondary Voltage and Calculated Turns Ratio for Various Transformer Tappings

Transformer Tapping	Primary Volts	Open-Circuit Secondary Volts	Turns, Ratio
H.5	400	5.40	74
H.4	400	4.10	97.5
H.3	400	3.30	121.5
H.2	400	2.74	146
H.1	400	2.33	172
L.5	400	2.62	152
L.4	400	2.25	178
L.3	400	1.95	205
L.2	400	1.75	229
L.1	400	1.58	253

Analysis and Discussion of Results

The short circuit secondary current obtained from the welding transformer on top tap with the smallest possible throat area was 21,700 amp rms, as compared with 12,300 amp rms for the same tap with the largest possible throat area, an increase of some 76 pct. The effective heat produced in the weld is proportional to the square of the secondary current, and from this point of view, the smallest throat gives an increase of 320 pct in heat as compared with that obtained using the largest possible throat area. The decrease in secondary current is approximately proportional to increase in both throat depth and throat opening, that is, proportional to increase in throat area over the practical range of dimensions investigated.

At each setting used in the tests, the secondary current has been both measured directly, and also calculated from the primary current. The results are all tabulated in tables I to IV. Secondary current was calculated in the usual way by multiplying the primary current by the turns ratio at each transformer tapping. Turns ratio for each tapping was calculated by dividing the primary voltage (400 v) by the open circuit secondary voltage. Magnetizing currents are not reported, since these were found to be of such a small order that they could well be neglected in all cases. In an effort to compare measured secondary current with calculated secondary current, a graph has been constructed as shown

TABLE II

Variation of Short-Circuit Secondary Current With Throat Depth at 2¾ In. Throat Opening

Transformer Tapping	Throat Depth, 18¾ In.			Throat Depth, 24 In.			Throat Depth, 28¾ In.		
	Primary Amp	Calculated Secondary Amp	Measured Secondary Amp	Primary Amp	Calculated Secondary Amp	Measured Secondary Amp	Primary Amp	Calculated Secondary Amp	Measured Secondary Amp
H.5	313	23,100	21,700	290	21,500	20,100	274	20,200	18,200
H.4	200	19,500	18,450	188	18,350	16,200	176	17,200	15,200
H.3	135	16,400	15,200	125	15,200	13,500	118	14,300	12,700
H.2	99	14,400	13,100	92	13,400	11,500	87	12,700	11,100
H.1	75	12,900	11,500	70	12,000	10,250	68	11,400	9,120
L.5	86	13,100	11,900	80	12,200	10,450	74.2	11,300	10,100
L.4	66.4	11,800	10,450	60.1	10,800	9,440	57.2	10,200	9,000
L.3	52.8	10,800	9,650	48.4	9,900	8,610	45	9,200	8,200
L.2	42.2	9,700	8,800	39.0	8,930	7,780	36	8,250	7,400
L.1	34.5	8,720	8,200	31.4	7,930	7,380	29	7,330	6,350

TABLE III

Variation of Short Circuit Secondary Current With Throat Depth at 7 In. Throat Opening

Transformer Tapping	Throat Depth, 18¾ In.			Throat Depth, 24 In.			Throat Depth, 28¾ In.		
	Primary Amp	Calculated Secondary Amp	Measured Secondary Amp	Primary Amp	Calculated Secondary Amp	Measured Secondary Amp	Primary Amp	Calculated Secondary Amp	Measured Secondary Amp
H.5	274	20,250	18,260	258	19,150	16,000	241	17,800	14,400
H.4	172	16,800	15,200	160	15,600	12,940	147	14,300	11,700
H.3	116	14,050	12,500	107	13,050	11,050	100	12,150	10,050
H.2	84	12,250	10,650	79	11,500	9,420	70.4	10,300	8,400
H.1	62	10,650	9,640	58.5	9,750	8,600	52.4	9,000	7,530
L.5	72	10,950	10,050	67	11,050	9,000	61	9,300	7,790
L.4	55.8	9,900	9,000	51.4	9,150	7,790	46.4	8,250	7,170
L.3	43.8	8,930	8,000	40	8,200	6,960	38.2	7,240	6,350
L.5	35.0	8,000	7,570	32	7,340	6,150	28.4	6,520	5,740
L.1	28.0	7,100	6,960	26	6,630	5,740	23	5,830	5,330

in fig. 8. It will be seen from this graph that measured secondary current is directly proportional to calculated secondary current for various throat dimensions. In the case of the smallest throat used, the calculated current exceeds the measured current by 8 pct for all taps on the transformer; in the case of the largest throat used, the calculated current exceeds the measured current by 25 pct for all transformer taps. The fact that the difference between measured and calculated secondary currents varies with throat dimensions indicates that the difference itself may well be closely connected with the nature of the secondary loop. The fact remains that no accurate rules can be given for calculating the secondary current of this type of welding transformer from primary current and turns ratio.

Fig. 9 shows the graphical relationship between secondary current and primary current, and also the relationship between secondary current and Kva demand. It will be noted that Kva demand is simply primary voltage (400 v) times primary current, and for this reason these two variables have been plotted along the same axis.

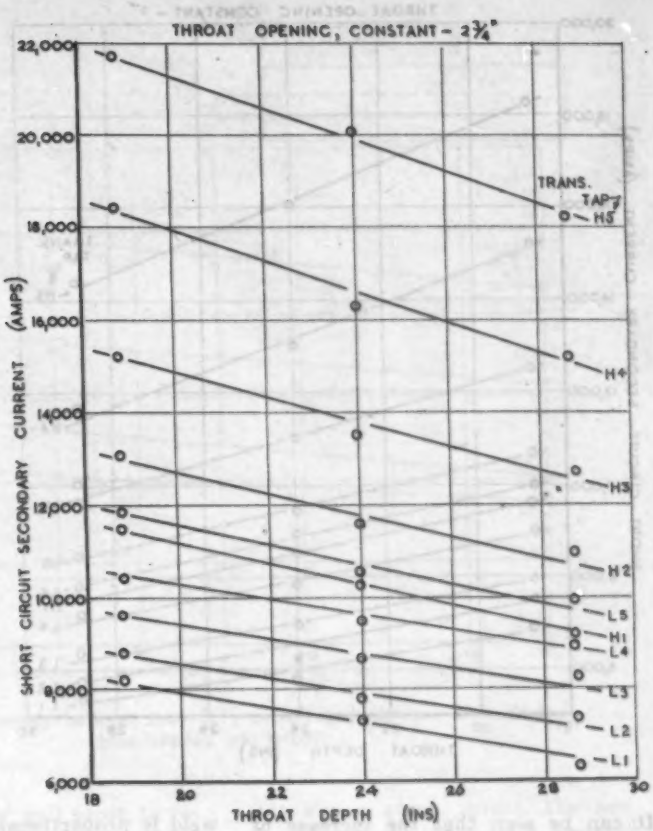

FIG. 2 — Relationship between short circuit secondary current and throat depth at 2¾-in. throat opening.

TABLE IV

Variation of Short Circuit Secondary Current With Throat Depth at 12¾ In. Throat Opening

Transformer Tapping	Throat Depth, 18¾ In.			Throat Depth, 24 In.			Throat Depth, 28¾ In.		
	Primary Amp	Calculated Secondary Amp	Measured Secondary Amp	Primary Amp	Calculated Secondary Amp	Measured Secondary Amp	Primary Amp	Calculated Secondary Amp	Measured Secondary Amp
H.5	240	17,800	14,400	217	16,000	13,200	205	15,200	12,300
H.4	146	14,200	11,100	130	12,700	10,470	125	12,200	9,850
H.3	93.2	11,950	9,850	90	10,950	8,820	89.4	10,800	8,200
H.2	70.4	10,300	8,400	62.6	9,100	7,590	59.5	8,510	6,960
H.1	52.2	9,030	7,390	46.2	7,950	6,570	42.6	7,330	6,350
L.5	60.8	9,200	7,600	54.5	8,300	6,930	53.4	7,670	6,550
L.4	47	8,370	6,750	41.2	7,320	6,040	33	6,730	5,740
L.3	36.4	7,450	6,150	32	6,550	5,633	29.6	6,090	5,120
L.2	29	6,620	5,740	25.4	5,900	5,020	23.8	5,450	4,920
L.1	23.4	5,910	5,120	21	5,310	4,510	19.2	4,930	4,300

TABLE V

Effect on Secondary Current of Inserting Mild Steel Tube and Sheet Into Throat

	Transformer Tapping	Secondary Short Circuited		Distance of Tube or Sheet in Throat									
				0 In.		4 In.		8 In.		12 In.		16 In.	
		Primary Current, Amp	Secondary Current, Amp	Primary Current	Secondary Current	Primary Current	Secondary Current	Primary Current	Secondary Current	Primary Current	Secondary Current	Primary Current	Secondary Current
Tube, 5¼ in. OD	L.1	21	5,330	15	4,300	14.4	4,100	14.2	3,900	12.4	3,700	12.0	3,480
Thickness, 14 Swg	L.3	36	6,550	26	5,530	24.4	5,330	23.4	5,130	22	4,900	21	3,930
Length, 16 in.	L.5	62.4	8,600	50.4	7,800	47	7,200	45	6,950	43	6,550	41.5	6,350
	H.3	102	11,100	94	10,300	85	9,800	81.5	9,200	80	9,000	77.0	8,630
Flat sheet, 16½ in. wide	L.1	21	5,330	15	4,500	14.0	4,300	14.0	4,100	13.5	3,800	13.5	3,680
Thickness, 14 Swg	L.3	36	6,550	26	5,700	25	5,320	24.5	5,120	24	4,700	24	4,500
Length, 16 in.	L.5	62.4	8,600	52	7,800	48	6,950	50.5	6,550	44	6,140	44	6,140
	H.3	102	11,100	89	10,000	83	9,410	80	8,600	77	8,600	75	8,400

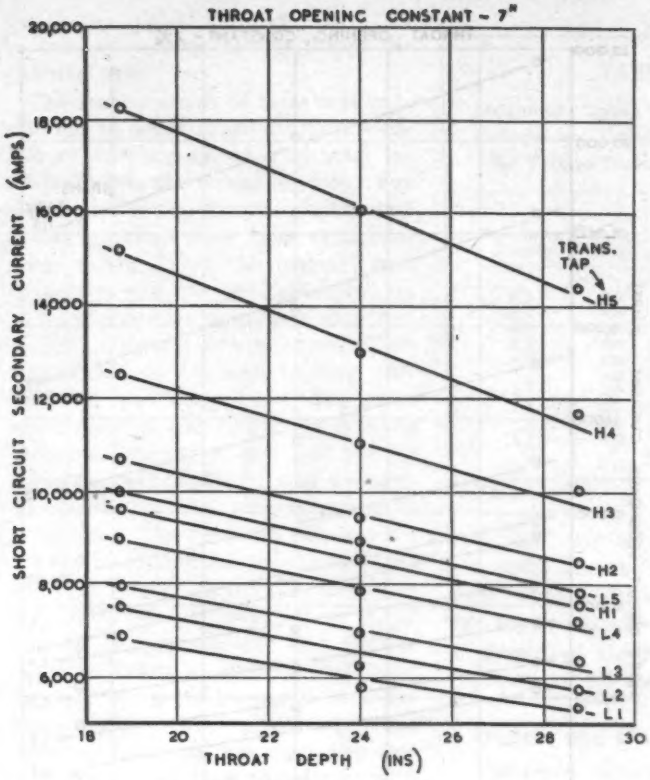

FIG. 3—Relationship between short circuit secondary current and throat depth at 7-in. throat opening.

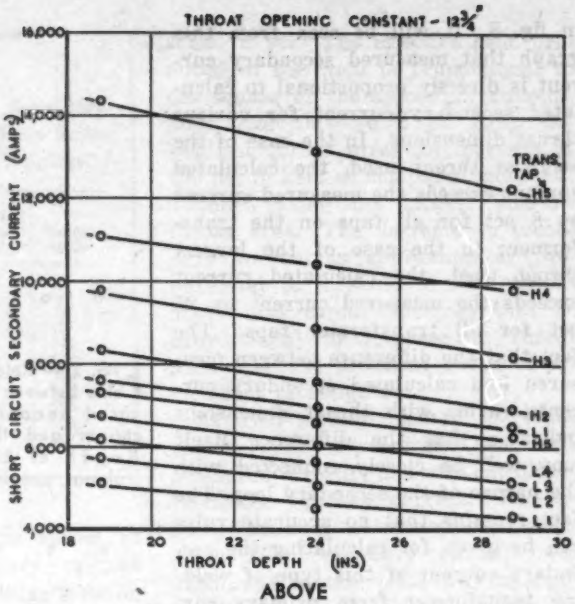

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FIG. 4—Relationship between short circuit secondary current and throat depth at 12¾-in. throat opening.

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It can be seen that the increase of secondary current with primary current and Kva demand is less as primary current increases; this applies for all throat areas plotted on the graph. It has already been stated that the effective heat input to a spot weld is proportional to the square of the welding current; this means that the welding current is by far the most important welding variable, because the other two factors bearing on heat input, namely, welding time and the resistance of the material to be welded, only affect heat input linearly, that is,

$$\text{heat input} = I^2 Rt$$

where I = welding current

R = resistance of material, and

t = welding time.

FIG. 5—Relationship between short circuit secondary current and throat opening at 18¾-in. throat depth.

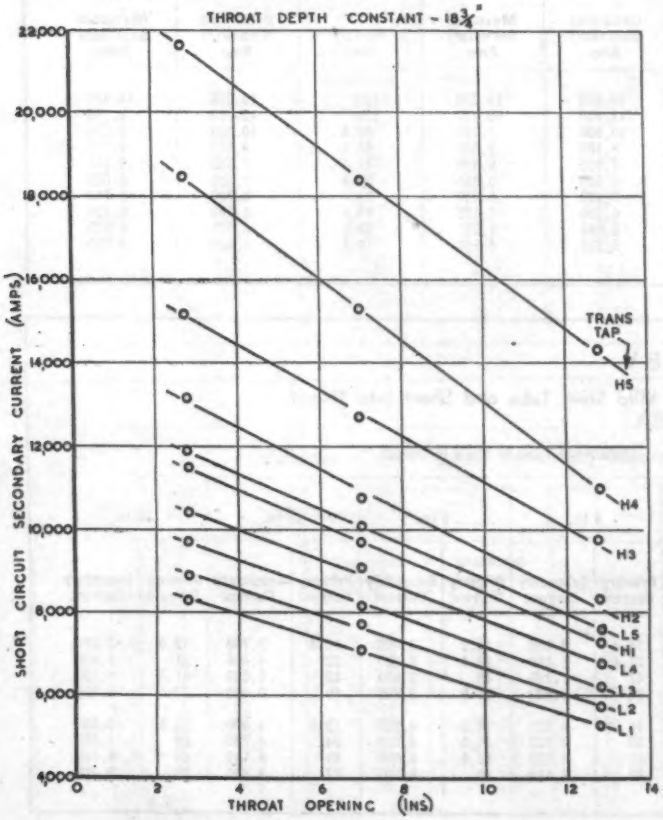
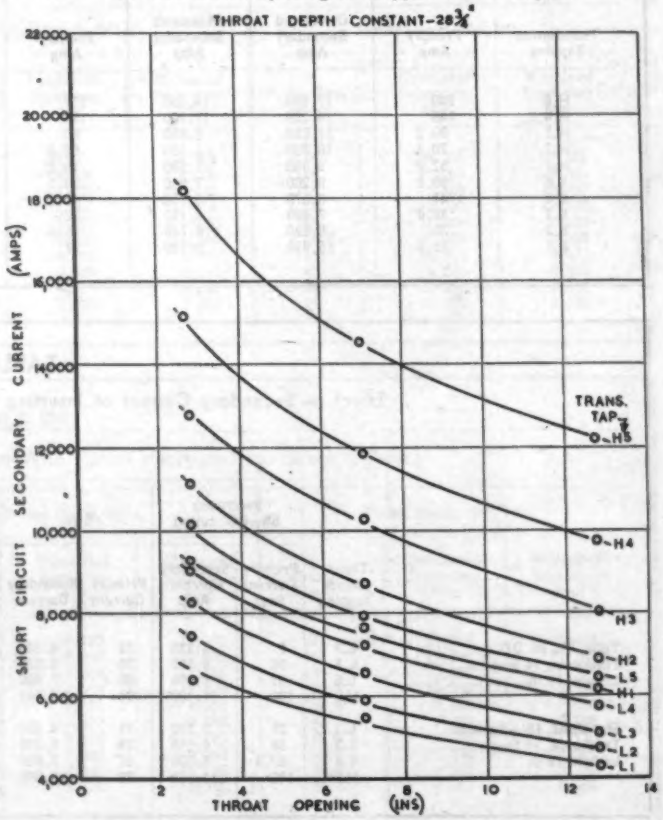


FIG. 6—Relationship between short circuit secondary current and throat opening at 28¾-in. throat depth.



If a particular job, for example, requires 10,000 amp on short circuit to produce the required spot weld size at a given electrode pressure and welding time, it can be seen from fig. 9 that this current is obtainable at a low transformer tap at the minimum throat dimensions, requiring 60 amp primary or 25 Kva; on the other hand, to produce the same secondary current using the maximum throat area, a very high transformer tap is required, taking 130 amp primary at 52 Kva, and representing an increased Kva demand of 108 pct for the same secondary current.

There is a great tendency on the part of users of spot welding machines to set the throat at its maximum depth, and then to open out the arms to suit all the various types of work for which the machine is likely to be used. The maintenance of a constant throat has certain advantages inasmuch as it eliminates the setup time that would otherwise be necessary to alter the electrodes and to realign them. Also, when recording machine settings, there would be no necessity to record the throat dimensions. Furthermore, there is a reduced risk of loose connections in the secondary circuit due to negligence on the part of the machine setter. The disadvantages of maintaining a constant throat opening and throat depth are twofold: The maximum current obtainable from the machine is needlessly limited, and a considerable waste of electrical power is the result if the throat is very much larger than is necessary.

It is a well known fact that the insertion of any magnetic material such as iron or steel into the secondary loop or throat of a spot welding machine, has the effect of increasing the inductive reactance of the circuit. This will result in a reduction in the secondary current if no compensating change is made to the transformer tapping. Fig. 7 shows the extent of this drop in current due to a tube, and also to a flat sheet containing the same amount of steel as the tube. On tap H.3, the current falls from 11,100 amp with the material inserted a distance of ⅛ in. into the throat, to 8600 amp with the material inserted a distance of 16 in., representing a drop in secondary current or welding current of 22.5 pct, or in terms of heat input into the weld, the drop is 29.5 pct, which represents a considerable decrease in the strength to be expected from a spot weld so formed. This drop in current may well prove to result in the final setting giving no weld whatever.

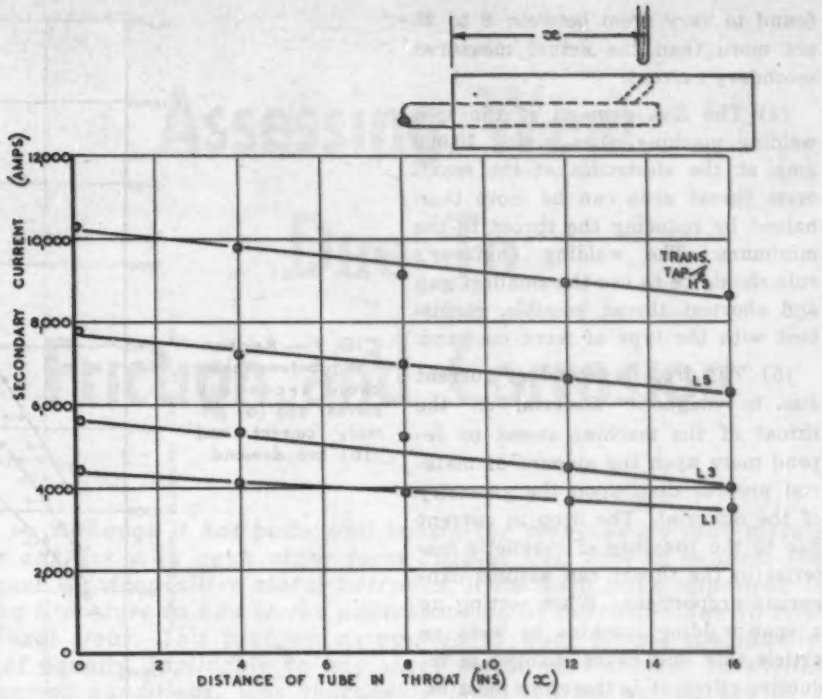


FIG. 7—Relationship between secondary current and distance of mild steel tube inserted into throat.

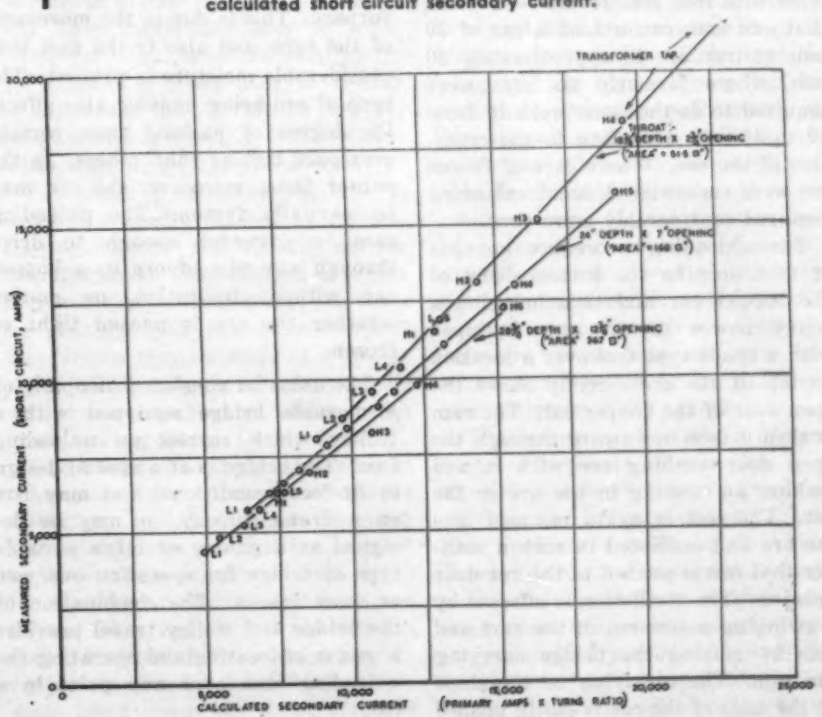
Conclusions

(1) An increase in welding current of 76 pct, representing an increase in welding heat of 320 pct, is obtained by using the machine at its minimum throat as against the maximum throat.

(2) For a given throat, the secondary current is directly proportional to the open circuit secondary voltage, except at very high currents, where the transformer core reaches saturation point.

(3) No definite rules can be given for calculating the secondary current from the primary current and turns ratio. The calculated current was

FIG. 8—Relationship between measured short circuit secondary current and calculated short circuit secondary current.



found to vary from between 8 to 25 pct more than the actual measured secondary current.

(4) The Kva demand of the spot welding machine when giving 10,000 amp at the electrodes at the maximum throat area can be more than halved by reducing the throat to the minimum. The welding engineer's rule should be to use the smallest gap and shortest throat possible, consistent with the type of work on hand.

(5) The drop in secondary current due to magnetic material in the throat of the machine seems to depend more upon the amount of material present than upon the geometry of the material. The drop in current due to the presence of magnetic material in the throat can assume dangerous proportions. When setting up a spot welding machine to weld an article that will cause changes in inductive effect, it is therefore most essential to see that weld test specimens are made with both minimum and maximum inductive effects.

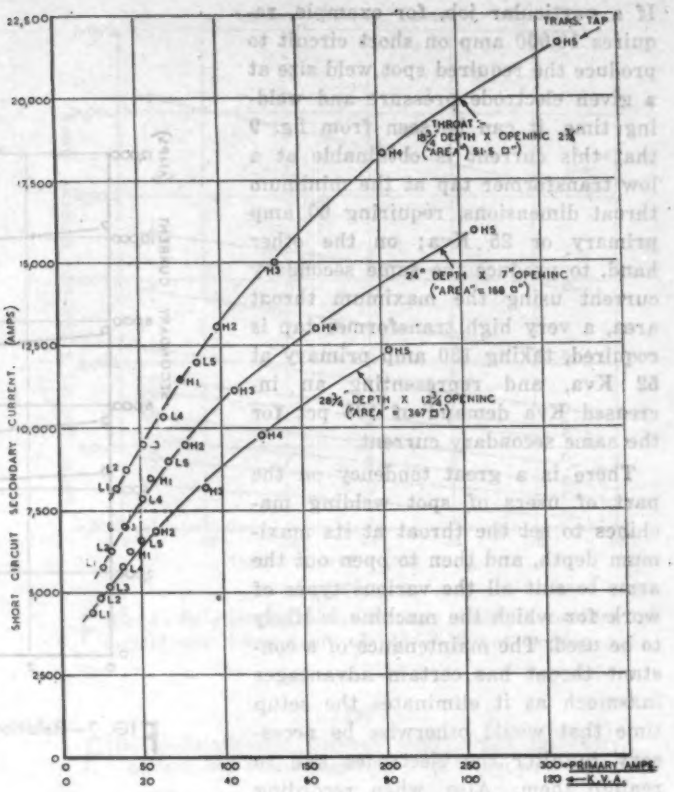


FIG. 9 — Relationship between short circuit secondary current and (a) primary current and (b) kva demand.

Mechanical Car Unloader

FOR saving labor in unloading cars, a new mechanical unloader has been designed and put into operation by S. P. Kinney Engineers, Pittsburgh, for unloading hopper cars filled with iron ore. It has been found that one man can unload a car of 70 tons of iron ore in approximately 20 min, where formerly six men were required to do the same work in from 30 to 40 min according to the condition of the ore. Where cars of frozen ore were encountered, hand unloading required considerably more time.

The unloading procedure consists of first opening the bottom doors of the hopper car and then bringing a heavy power driven ram equipped with a spade type tool over a location on top of the ore directly above the open door of the hopper car. The ram is then driven downward through the open door pushing ore with it and making an opening in the ore in the car. The tool is again rammed into the ore and oscillated in such a manner that ore is pushed to the car door opening. The oscillation is effected by a swinging movement of the ram and also by moving the bridge carrying the ram. The ore lying on the slope at the ends of the car is easily pushed to the door opening by the spade.

It has been found that ore transported directly to the blast furnace from lake ports is packed fairly tight in the cars upon arrival at the blast furnace. This is due to the movement of the cars, and also to the fact that considerable moisture is present. The type of ore being handled also affects the degree of packing since certain ores pack tighter than others. In the winter time, moreover, the ore may be partially frozen. The unloading ram is powerful enough to drive through any pile of ore in a hopper car without hesitation, no matter whether the ore is packed tight or frozen.

The unloader consists principally of a movable bridge equipped with a trolley which carries an unloading ram. The bridge is of a special design to fit local conditions, and may run on a crane runway, or may be designed as a gantry or other suitable type of bridge for operation over one or more tracks. The combination of the bridge and trolley travel provides a means of locating and operating the unloading ram over any point in a car.

The ram head is equipped with a wide-faced, spade-type tool suitable for unloading ore, coal, slag, clay or other bulk materials from hopper cars. The tool is removable and can be easily and quickly replaced by other tools. After the car doors have been opened, the ram is used vertically to push a hole through the material from the top of the load over each door, thus starting the flow of material. After that the ram is used in a vertical or sloping position, as required, to push the balance of the load to the doors and out of the car. It may be tilted or swung through an arc of 45° from the vertical position, either forward or backward.

The operator's cab is placed in a convenient location on the bridge or in special cases may be located and supported on the building structure. Controls for all motors are provided in this cab. A walkway is located on each side of the bridge. A complete switchboard, fully wired, is furnished and arranged for installation on top of the walkway.

Necessarily the design of the unloader depends on local conditions and clearances available.

Assessing Wear Due To Friction and Corrosion

. . . Although it has been well known for many years that metals in contact with each other form couples and that in general the more electropositive metal corrodes, little data have appeared in the literature to add to the understanding of corrosion due to frictional wear. This problem as applied to door hinges specifically, but equally applicable to any sheet metal part subject to similar service conditions, was thoroughly investigated by the use of a specially designed testing machine. Complete design details of this testing device and the computation of results, first appearing in Sheet Metal Industries, London, are herein presented.

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By PHILLIP M. FISK

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CORROSION of sheet metal parts has, heretofore, been examined from the point of view of static systems only. Thus it is known that brass fittings should not be attached to aluminum stock, and if possible no pairs of metals likely to cause corrosion should be employed in water systems. Very little, however, appears to have been done to explore that corrosion which takes place in moving parts.

A number of machines have been devised to investigate the subject of fatigue corrosion, which is of great importance in dealing with machinery subject to fast or heavy loading under mildly corrosive conditions. While, however, examination of this type of corrosion gives a great deal of information about such components as shafts subject to torque, or leaves being bent with sudden changes in direction of bending, it gives no information about the wear which may take place in, for example, hinges.

When, therefore, the writer was asked to investigate the use of diverse types of materials in hinges, it was felt that a new approach to the matter should be made by constructing a machine which would simulate conditions of usage. It is true that any information obtained would probably be empirical rather than fundamental, but examination of the problem will show that fundamental work, if not almost impossible, would be, at any rate, too large in scope for the average industrial laboratory, and the results would be obtained only after so long a time that actual specimens used in the field would have given practical demonstration of the efficiency of any combination of metals before the results could be obtained from the laboratory.

Before describing the machine, however, it will be useful to examine the various reactions which occur in the hinge of a swing door. The door is opened and shut at very frequent intervals during the day, and then allowed to stand all night without movement. The hinge may receive little or no attention from the oil can. The oil used may have too low a viscosity to remain in the hinge; it may decompose giving free fatty acids; it may have insufficient body to withstand the high pressure existing in the hinge of a heavy door, or it may be so viscous that it fails to flow between surfaces brought into intimate contact by the weight of the door.

The material of which the door is made is probably decided by circumstances outside the control of the manufacturer. The architect of a factory will specify steel doors; the theater designer may require aluminum; shop fronts may be made of stainless steel; offices may have bronze grills and banks mahogany doors with brass kicking plates.

The fittings and hinges attached to these doors are screwed, riveted or welded on, and care has to be taken that electrolytic couples are not set up about these junctions. This limits the choice of materials for the hinge leaves. This choice again restricts the choice of metal for the hinge pin. In order, therefore, to avoid corrosion, some compromise has to be made as to the types of metals to be placed in proximity to each other.

Failure of the system, door-stock, hinge-leaf, hinge-pin, will not be due solely to electrolytic corrosion; there is also the concurrent effect of friction. Assuming that the bearing surfaces are inadequate, that lubrication is absent and that movement of the hinge is frequent, it will be seen that wear will be high. Where the best conditions of design, maintenance and use are present, wear will be at a minimum. These obvious results will only be obtained, however, if no corrosion occurs. If, due to poor choice of material, to excessive atmospheric attack or to the use of unsatisfactory coatings on metallic surfaces, products of corrosion intrude themselves between the surface, excessive wear will occur, even in properly designed and maintained components.

The presence of particles of inclusions or products of corrosion, is not the only cause of frictional wear due to corroding influences; there are also the products formed by the breakdown of coating materials. Lastly, wear may result from scoring due to high spots of metal more resistant to corrosion than surrounding areas.

Against the wear due to particles, must be put the effect of burnishing

the wearing parts and the production of a Beilby layer, possibly tending to slow down corrosion. On the other hand, there are two effects normally opposing corrosion which might be expected to be absent in the case of moving parts. The first of these is reversed polarity: when corrosion occurs it is possible that the products of electrolysis may give rise to conditions which cause the current produced to flow in the opposite direction to that producing corrosion, and so reduce further corrosion. The removal of the products of corrosion from the neighborhood of either electrode of the small cell referred to previously will prevent this reversal of polarity. The second effect is the prevention of stifling, which occurs when small discontinuities, such as occur in hot-dipped lead coatings, cause corrosion of the basis metal, the products of corrosion then filling up the cavity and preventing further entrance of corroding fluid. It might be expected that movement of the metals would cause a dragging effect tending to loosen the stifling material and so allow further attack on the basis metal.

Testing Machine Design

When considering the design of the machine a number of factors had to be taken into account:

(1) The action had to bear some resemblance to service conditions. It might have been best, of course, to build a machine with cranks to operate hinges. This, however, would have restricted the use of the equipment to the examination of hinges, whereas the results obtained should be applicable to any pair of metals, one of which rotates, or slides, on the other.

(2) The machine had to be capable of running with a large number of samples under examination at the same time. This ruled out the use of cranks referred to above, owing to the resulting complexity.

(3) Failure of one part under examination should not stop the machine or prevent the samples from being operated. This means that curls could not be used in case one would seize and stop the machine, or the pin might break and prevent other samples further away from the driving end of the equipment from moving.

(4) The pressure applied between the rubbing surfaces had to be capable of variation.

(5) The apparatus had to be capable of employing any corroding fluid at any metallic junction.

(6) Each pair of metals had to be isolated from any other pair and from the framework of the equipment. This was important, not only to insure that cells in series would not be built up by passage of current from one pair of metals to the next, but also to avoid the presence of stray electric currents from the motor employed to drive the equipment.

(7) It had to be possible to measure the wear taking place in both metals, and to examine if necessary the crystalline structure in the neighborhood of the rubbing surfaces.

(8) Means had to be available for measuring any change in the tensile or impact strength of either component.

(9) Variation in speed of relative movement of the components had to be possible.

(10) Lateral movement had to be prevented, in other words, wear had to be confined to one channel only.

(11) Means had to be provided for timing the apparatus.

(12) Analysis of the products of corrosion had to be possible.

(13) Lubricants, as well as corroding fluids, had to be easily applied.

In designing the machine, full details of which are shown in the diagram, it was decided that the bearing surface should be a stationary right-angled notch pressing onto a revolving shaft. The notch was cut as shown in the diagram and was allowed to rest on the shaft so that, as far as possible, equal pressure was exerted on both its surfaces. This was effected by allowing the back support of the plate in which the notch was cut to be at such a height that the plate was practically horizontal. It was not considered desirable to use a semicircular notch, owing to the great difficulty of insuring complete contact between the profile of the notch and the shaft when the test was commenced. If contact was not assured then only single line contact could occur if the diameter of the shaft were less than that of the notch; if it were larger the contact could only be made at the edges of the notch. Lastly, great difficulty would be experienced in machining the notch to insure that an exact semicircle of metal was removed. With a right-angled notch, however, two-line contact is always certain, and provided the angle is correct, not a very difficult machining operation, wear will always be a function of the diameter of the shaft, even if small variations occur in the depth of the notch.

In any pair of metals, therefore, the plate with the notch cut in it, may be regarded as the hinge leaf while the revolving shaft is the hinge pin. The pins are driven by a motor, variations in speed being made by changing the driving sprockets, or by driving through infinitely variable gears. Each shaft has a square shank on its end, by which it is driven by means of a plastic bush with a square hole cut longitudinally through it. Each bush is driven by one shaft and transmits the movement to the next. The shafts are kept apart by a small piece of rubber inserted between the shanks at either end. Small ball bearings having internal dimensions equal to the outside dimensions of the plastic bushes carry the line of shafts. End-play of the line of shafts is prevented by the use of a small shaft after the last plastic bush. One end of the shaft has a square shank, while the other is pointed and rotates in a countersunk cone at the center of a small plate held in position by four spring-loaded nuts, as in the diagram.

The end on the plate remote from the notch is supported on a steel rod covered in rubber tubing, and lateral movement is prevented by the use of small collars screwed tightly on either side of the plate. It is essential that rubber be used, for although glass is a nonconductor it may give a continuous conducting film.

On the top of the plate a deep notch is cut. This is used to carry a lead weight, hung on a string. The purpose of the weight is to insure equal pressure of the plate on the shaft, irrespective of the metal used. If only the weight of the plate is taken into consideration, then greater pressure will be exerted by, say, stainless steel than aluminum. The weight used should, of course, bear some relation to the actual bearing pressure of the components under review. It is important that the weight should not produce a movement in the shaft, or as this revolves fatigue may occur due to the alternating tension and compression in the neighborhood of the point of application of the load. This fatigue in the presence of corroding fluid may give intercrystalline corrosion leading to failure of a different

kind and an earlier date than would occur with an unstressed bar.

In the experiments carried out, a load of 8 oz was used on a bearing surface 0.25 in. wide, the weight being adjusted by the use of an auxiliary frame and pulleys.

The corroding fluid is led to the bearing surfaces by means of wicks inserted into glass jets applied to the side of the plates by plasticine. Originally attempts were made to adjust the flow by the use of nozzles inserted into rubber tubing that was compressed to control the flow by means of screw clips. It was found that these gave constant trouble, while the wicks, provided they were renewed at frequent intervals, gave no trouble at all.

Beneath the rotating shaft, a beaker is placed to receive the corroding fluid after it has been through the bearing surfaces. After the lapse of time necessary to complete the experiment, particles of products of corrosion are removed from the bar and the plate, using a bone spatula, and analysis made. This is done to ascertain the relative decomposition of the two metals, and in the case of coated metal, ascertain how much of the coating has been removed.

Wear on the shaft may be measured by a micrometer, but it is essential that the profile of the groove worn be examined as a shadowgraph, since in some cases wear has been found to occur unsymmetrically, as shown in the diagram. In some cases, wear had taken place on the side fed by the corroding fluid, and in other cases on the opposite side.

The shafts used were all made in the form of a tensile piece, in order to ascertain whether wear had reduced the ultimate tensile strength, excluding any reduction in cross-section. If no test of this kind is required, the shaft can, of course, be made plain, in which case it may be sectioned for microscopical examination.

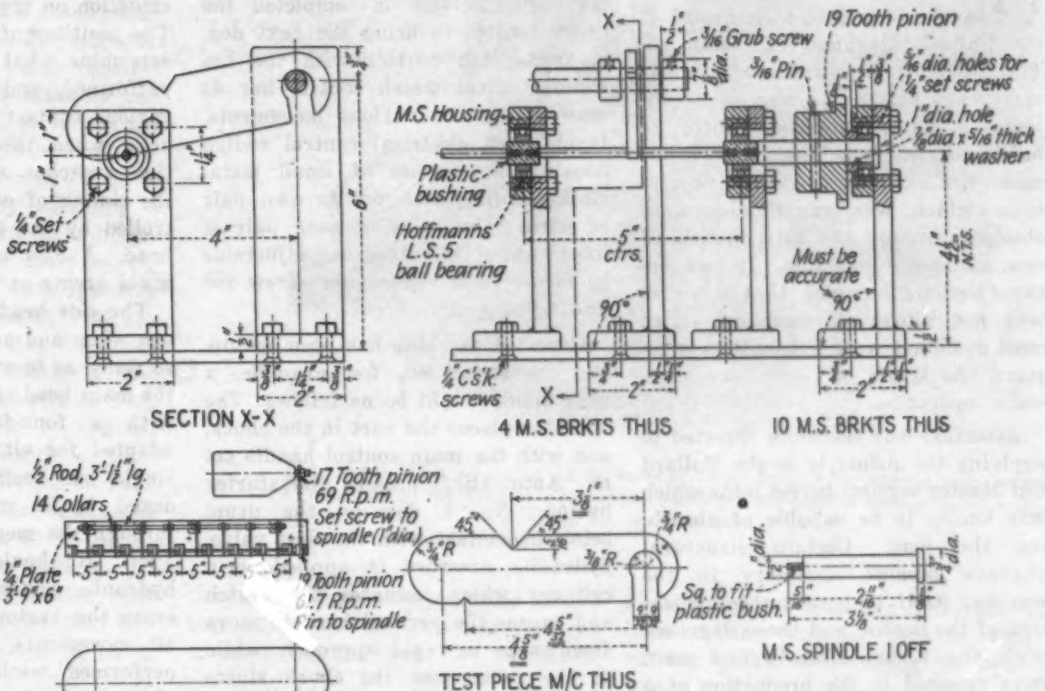
Wear on the plate is computed by examination under the microscope. The plate is cut vertically through the plane of the notch, at right angles to the shaft, that is, along the length of the plate, and the cut section polished in the ordinary way. This gives an average view of the wear that has taken place. Under the microscope, this is seen as an angle with two sides cut by arcs of the same circle. In the case of extremely small wear, the indentation is almost negligible, while in the case of heavy wear, the angle may be entirely eliminated. Etching of the polished surface will show the presence of intercrystalline corrosion. An interesting effect has been noticed in the case of these metals, for example cast iron, which contains comparatively large inclusions: these were found to have been detached bodily, giving not a smooth ogive but one having irregular sides.

Timing of the period of attack may be made either with a revolution-counter, or by timing the motor and running for definite periods. In these tests, the latter method was adopted; the motor ran at approximately 1 rps, and an estimated one million revolutions were made. The slow speed was considered necessary in order to avoid heating effects, which would not normally be present in a hinge. The apparatus is so flexible in its use, however, that any speed of rotation which will not eject drops of fluid could be employed.

Testing of lubricants, although not carried out during this investigation, could be performed by the use of a second wick, through which the material under examination passed.

A great deal of information can be obtained by frequent examination of the progress of corrosion. Thus it was noticed that some aluminum alloys gave an immediate darkening of the fluid collecting in the beaker; steel gave in some cases a reddish fluid, but not in those cases giving cathodic protection, while effects showing the protecting power of sherardizing could be seen up to the point where the coating broke down almost abruptly.

It is unnecessary to more than mention that a variety of cycles are possible with the machine permanently wet with constant rotation, permanently wet with periods of rest, constant rotation with intermittent wetting and dry periods, and so on.



APPARATUS for determining comparative corrosion for window hinges.

Acknowledgment

The writer wishes to thank his late assistant, E. F. Pellowe, for a considerable amount of help in the running of the equipment and for analyses carried out, which although not available for publication, nevertheless demonstrated the value of the machine.

Automatic Operation of Vertical

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A VERY significant machine tool development has been revealed by the first public disclosure of the Bullard Machine Co.'s Man-Au-Trol. This device was conceived several years before the war as an attempt to apply automatic control to hand-operated machines, and thus modernize existing production equipment which was rapidly becoming obsolete through the introduction of new automatic machines. It soon became obvious, however, that this idea was not altogether practical, since most machines were not built to withstand the strain of continuous automatic operation.

Attention was therefore directed to applying the principle to the Bullard Cut Master vertical turret lathe which was known to be capable of absorbing the load. Certain structural changes became necessary in the machine itself to permit the application of the device, and these, together with the actual Man-Au-Trol unit, have resulted in the production of a new machine of remarkable flexibility.

Test machines were put into service just before the outbreak of war, but the usual secrecy orders prohibited disclosure of their existence. A battery of these, however, remained in constant use on war production, and substantially increased Bullard's war material output. In addition they gave the company an unusual opportunity for proving their capacity, and for working out minor troubles which are apt to afflict any new machine. At the present time the new unit can be applied only to the company's vertical turret lathes, but there would appear to be a substantial field for other applications, not necessarily in the machine tool field, where automatic control of a series of functions must be continuously maintained.

The unit is applied to both the main and side heads, or to either one as desired, and consists essentially of a control box and a series of horizontal and vertical electrical control switches enclosed in suitable housings. Inside the control box is a metal drum carrying a series of adjustable dogs which make possible a total of 39 different machine functions, including vertical and horizontal movement of the heads, and changes of speed and rate of feed. As each function is completed the drum rotates to bring the next dog, or dogs, into contact with the hydraulic valves which control but do not actuate the various movements. Inside each electrical control switch housing is a series of small metal blocks sliding each on its own pair of wires. One wire of each pair is fixed while the other is adjustable by means of a micrometer screw for fine adjustment.

Once the machine has been set up, the operations on, for example, a gear blank, might be as follows: The operator places the part in the chuck, and with the main control handle set to "Automatic," presses the starter button. No. 1 dog on the drum being in contact with the first valve, hydraulic pressure is applied to a cylinder which actuates the clutch and causes the vertical head to move downwards in rapid approach, while at the same time the chuck starts to rotate at the predetermined speed. As the tool approaches the work, a contact strip attached to the main head slides down the back of the vertical switch housing and makes electrical contact with the first switch block, closing a 32 v circuit and operating a solenoid. This in turn opens a valve, permitting a hydraulic cylinder to actuate the feed control lever and thus shift to cutting feed. The boring tool rough bores the hole in the hub, and at the same time the OD is rough turned.

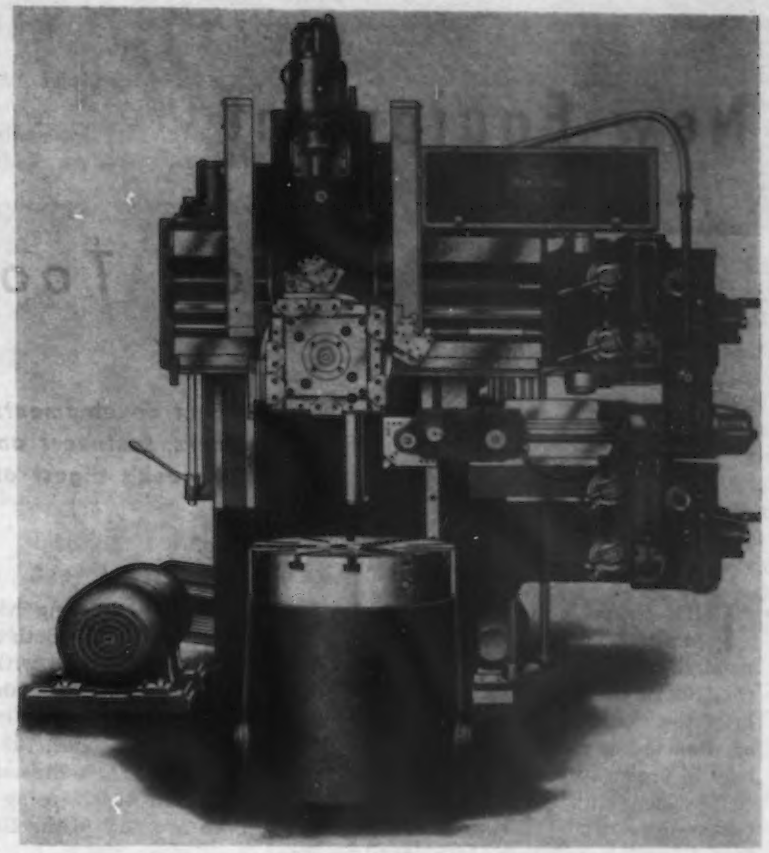
When the head has traveled down the desired distance, the contact strip makes contact with the second switch block, tripping a solenoid which operates another hydraulic valve and stops the feed mechanism. The drum then rotates one notch, bringing the second dog against the second valve to engage the reverse clutch and cause the head to withdraw. Again the drum rotates, and the third dog causes the head to move sideways, as little as 0.001 in. is desired, until it is stopped by the horizontal contact strip making contact with the first switch block in the horizontal switch housing. The finish boring cut is then taken. In this way, by successive movements of the drum and contacts with the switch blocks, the part may be completely machined without any attention on the part of the operator. The positions of the dogs on the drum determine what operations are to be performed, and the positions of the various contact blocks determine exactly when these are to occur. No time switches are necessary because the timing of each movement is controlled by the actual position of the head. A 32-v circuit is employed to avoid arcing at the contacts.

The side head may be brought into use when and as desired, and may be so timed as to avoid interference with the main head. Each head is equipped with a four-face indexing turret adapted for either multiple block or single bar tooling, and each is indexed by a small separate motor through the medium of the Man-Au-Trol. It should be noted that the hydraulic system serves only to operate the various clutches, and that all movements of the machine are performed mechanically by the use of feed screws.

Altogether there are 39 separate stops on each head for indexing, sizing, or for vertical or horizontal movement or other function. Rate of feed or spindle speed may be changed automatically during operation of the machine if desired, or at any time during the operation cycle. If all 39 stops are not utilized, there is no waste time waiting for the machine to complete an idle cycle; the unused contact blocks are merely set in a neutral position, and the drum automatically indexes around at high speed to its starting point.

In addition to the complete automaticity thus obtained, the machine may be instantly converted to manual operation by moving over the main control handle to "Manual" position. Thus, if it should be necessary to machine one or two pieces to special dimensions in the middle of a production run, the Man-Au-Trol is disengaged and the machine operated as a standard Cut Master. Then, provided of course the tools themselves have not been changed, the automatic

Turret Lathes



MAN-AU-TROL equipped 30 in. vertical turret lathe. The control units may be seen at the extreme right of the machine, one for the vertical head and one for the side head.

control is re-engaged and operations will continue as before.

Setting up is by no means as difficult as might be supposed, and although it does take a little more time than on a standard machine, this is very quickly offset by the tremendous gain in production time. For example, a machining sequence which requires 20 min on a standard machine can be performed in 4 min, 45 sec on the automatic. Each function of the machine, feeding, indexing and so forth, is established by inserting a dog into the appropriate hole in the drum, and each stop or start is controlled by adjusting a corresponding switch block. Approximate adjustment is obtained by sliding the block along the wire and locking it into place by means of a set screw. Fine adjustment is performed by the use of a special wrench which engages the end of the movable wire through a micrometer screw. Graduations on the wrench are spaced about ¼ in. apart, each representing 0.001 in.

Several years of experience have convinced Bullard engineers that better results can be obtained by using the same tool for roughing and finishing, relying on the automatic control to move the tool over the necessary amount for the finishing cut, and to back it away from the work to avoid scoring before withdrawing the head.

Electric Furnace Atmospheres

FURNACE atmospheres of various charges were investigated in two basic electric arc furnaces by Lars Villner and Allan Worro and the results published in an article entitled "Furnace Atmosphere in Arc Furnaces and Its Effect on the Hydrogen and Nitrogen Content of the Steel" that appeared in *Jernkontorets Annaler*, No. 3, 1944.

One of the furnaces that had graphite electrodes was found to be much more impervious than the other that had Soderberg electrodes, as the nitrogen content of the first furnace was considerably lower and the CO content higher. A very high hydrogen content in the furnace was found on several occasions, particularly during slag refining, when the calcined lime introduced moisture into the furnace, and also when lime was added during the refining process.

Measured loss of nitrogen by the steel during cooling was found to be considerably less in some charges than in others. This was explained by the fact that while there may be loss of nitrogen during the boil, nitrogen may also be absorbed by the charge. During the process of drawing off slag and preparing the refined slag, no appreciable absorption of nitrogen occurs, although the steel is not then protected by the slag and the furnace atmosphere has a high nitrogen content. During refining, however, a certain absorption of nitrogen occurs, the average over 12 charges amounting to 0.002 pct. During this period the slag shows a progressive absorption of nitrogen so that the nitrogen content can finally rise to as much as 0.15 pct.

The hydrogen content of the steel in a few charges was examined by analyzing the gases given off during the boil. These experiments showed that during the preparation of the refining slag, the steel absorbs large amounts of hydrogen from the moisture in the calcined lime and that at least some of this hydrogen remains in the steel during the tapping process and finally that the treatment of the slag first with limestone and then with calcined lime affords a certain degree of protection against nitrogen absorption.

New Equipment

Small Tools

. . . Recent developments in drills, gages, boring bars, hand tools, toolholders, fasteners and other instruments are described in this week's digest of manufacturer's announcements.

THE Castweld method of setting industrial diamonds has been announced by *Precision Diamond Tool Co.*, 102 S. Grove Ave., Elgin, Ill. In brief the shank is bored, and position of diamond is predetermined and is held in position during casting operation. The shank is heated to proper temperature and brazing metal is forced under pressure into cavity through flow hole. This method is said to protect the diamond from sudden change in temperature as would occur when diamond at room temperature is suddenly plunged into molten metal. This method avoids all open flame heating of the diamond during the setting operation. This method also provides a solid matrix around the diamond free from air holes. Diamonds may be set accurately to specifications because they are positioned before heat or brazing metal is applied.

Diamond Hand Hones

TWO pocket-size Bay State vitrified diamond hand hones have been announced to the trade and to jobbers, hardware suppliers and other distributors by the *Bay State Abrasive Products Co.* of Westboro,

Mass. These diamond hand hones are exceptionally good for touching up carbide tools before they become too dull, keeping them sharp for most efficient cutting and prolonging tool life. Both pocket-size models are available with a diamond section 7/16 in. wide by 1 in. and 1½ in. long with 1/16-in. depth of diamonds. Both styles of hand hones are supplied with plastic handles and each is furnished in a handy leather pocket case. One model has a hone at both ends, the other a hone at one end. These diamond hones are for use in shops using carbide tools. Both are new to the Bay State line.

Torque Wrenches

THE Jotee and the Joel, are two new tools announced by *Jo Mfg. Co.*, South Gate, Calif. These new torque wrenches were announced originally for lighter precision assembly on aircraft and are particularly

suited to the needs of manufacturers reconverting to the production of washing machines, refrigerators, stoves, radio and other appliances. The action of both tools is positive releasing when the predetermined torque is reached, making errors in judgment impossible. Their adaptability strongly recommends them in working with plastics where damage to materials from overtightening is likely to be high.

Boring Bar

TESTS and development work on a new and greatly improved boring bar have been announced by *Behr Products Co.*, Warren, Mich., developor of the B. & B. Spot Facer. This new tool is designed in two standard head diameters, 2 in. and 3½ in. for use on vertical or horizontal lathes. screw machines and all types of precision boring machines. It is also said that in recent tests the new Behr Boring Bar eliminates chatter, takes a faster feed and up to four times wider cut than average tools, greatly increasing production and at the same time reducing tool bit grinding. This machine is extremely rigid and rugged in construction and is said to have an accurate micromatic blade adjustment. Blades are available in a full range of sizes either Tungsten Carbide tipped or faced, or in high speed steel. Blades are quickly and easily interchangeable by a half turn of the blade release mechanism.

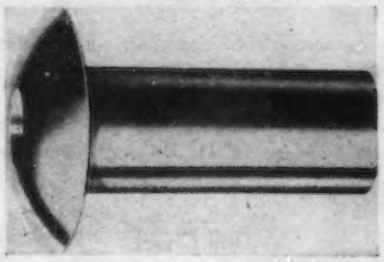
Cylindrical Plug Gage

A RECENT addition to their line of precision tools is the Dubl Duty Cylindrical Plug Gage, announced by *Schrillo Aero Tool Engineering Co.*, 8715 Melrose Ave., Los Angeles 46. This gage has a light aluminum alloy collet type handle which firmly positions a set of wire type cylindrical plug gages. This unique type of handle enables the user

to reverse the gage member after it has worn under the allowable limit, and take full advantage of the unused gaging surface that was formerly in the handle. This feature increases the gaging life and lowers the cost per hole gaged. There are no tapers, no drift pins and no split handles.

Threaded Tubular Rivet

THE Rivnut, a one-piece internally threaded and counterbored tubular rivet which can be upset or headed from one side with a simple tool and used as a blind rivet, nut plate for attachment, or both, is now being made in steel, it has been announced by the *B. F. Goodrich Co.*, Akron, Ohio. Originally made only in aluminum and then also in a brass alloy, extension to steel will allow much greater utilization of the product. The aluminum Rivnut was initially used for airplane industry applications, but the field has been broadened to include many other services. The standard steel Rivnuts are said to be made in 6-32 thread, 8-32 thread, 10-32 thread, 12-24 thread, ¼-in. 20 thread and 5/16-in. 18 thread. They can be made



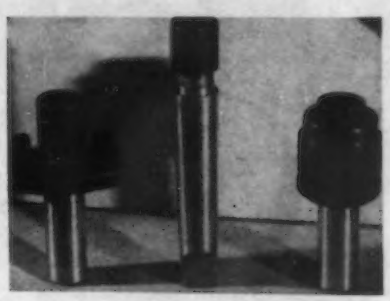
in special sizes on order. An additional head style, the brazier head is introduced. The trailer and bus industry using this because of the ease of cleaning, there being no sharp edges around the head.

Air Hammer

A SMALL, powerful pneumatic hammer, said to deliver some 13,000 blows per min and operating on less than 2 cu ft of air at 80 to 100 psi, has been announced by *Superior Mfg. Co.*, Public Square Building, Cleveland 13. Originally designed for special applications, where a small tool with plenty of power and long lasting qualities were demanded, the air hammer has been sold almost exclusively to war production plants. Weighing less than two lb, the hammer, named the "Bantam Bully" fits easily in the hand. A pistol grip handle, of dimpled aluminum casting, gives the operator comfortable control of the rapid-firing power of the hammer. The valve control, in pistol trigger position, adds to the ease of control. Uses so far announced for the tool include all kinds of cold chiseling of metals, peening, welding flash stripping, light scaling, light riveting, forming and finishing, routing of all kinds, paint and rust removal, star-drilling cement, caulking, template marking, loosening stubborn threaded fastenings by vibration and cutting and vibrating jobs in electric motor and small machinery assembly.

Floating Tool Holder

INCLUDED in the line of Chuck and Floating Tool Combinations is a Floating Tool Holder of revolutionary design, which has been announced by *Kett Tool Co.*, 5 E. Third St., Cincinnati 2. It is said that the outstanding accuracy, gripping power and long life of these tools, combined with their unusually small size, make them ideal for use with screw machines, lathes and drill presses, on drilling, reaming, and small tapping operations. The Kett Chuck is said to satisfactorily hold shank sizes from No. 80 drill to a full ¼-in. without changes of any kind. Saves times, saves labor, in tool



chucking operations, because it eliminates the necessity for many sizes of bushings and collets for machine set-up requirements.

Shock Absorbing Cushion

CHIPPING or breaking of carbide tool tips, particularly on interrupted cuts, can be prevented by the use of a special shock absorbing cushion, which has been announced by *P. J. Baima*, 31 Runnemede Ave., Lansdowne, Pa. In practice, a strip of the special shock absorbing material is covered with a strip of brass shim stock brazed or screwed to the tool shank, or inserted between the tool and the tool holder. It is claimed that the use of this cushion will permit faster feeds and speeds, and deeper cuts, and also help prevent damage to the machine. The high conductivity of the brass strip carries heat away from the tool tip, and is said to help prevent warping of the work due to the heat generated in cutting.

Metro Positioner

THE purpose of the new model S Metro Positioner, announced by the *Metro-Vise Co.*, 236 Stephenson Bldg., Detroit 2, is to simplify the tilting of work during various assembly operations, by permitting the angle of tilt to be adjusted almost immediately and without the necessity of stopping work to manipulate wrench. It is said pressure by the babbitt jaws is sufficient to hold the ball in shiftproof

position during normal assembly operations. However, when the vise or fixture requires to be given a different angle, the ball is instantly responsive to simple hand pressure. There are no fixed graduations, therefore there is unlimited freedom of movement, any angle, any direction. When proper adjustment is made there is no time lost in making tilting adjustments, and both hands are left free for other work. By means of a simple adjustment screw, the tension of the spring can be adjusted to the character of the work being performed.

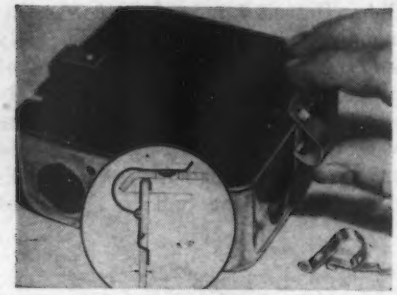
Keyless Chuck Grip

A KEYLESS chuck which holds the drill securely without the usual tightening by hand with the customary key has been announced by *Turner Bros., Inc.*, affiliated with the *Turner Gauge Grinding Co.*, 2625 Hilton Rd., Ferndale 20, Mich. This chuck grip is automatically and progressively strengthened with increased load pressure. This self-energizing chuck tightens itself by the action of the drill, and hardened bearing steel roller-jaws grip the drill without chewing or scoring. The drill will not

slip in use. The chuck is automatically self-centering and the drill will run true without the necessity of making adjustments by hand.

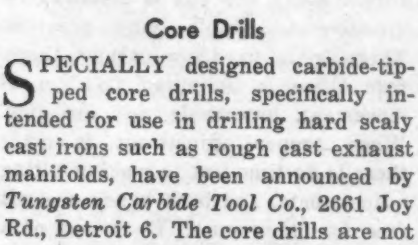
Steel Fastener

AVAILABLE for use on sheet metal, die cast, plastic or plywood boxes of varying wall thicknesses, a spring steel fastener for box covers, has been announced by *Tinnerman Products, Inc.*, 2040 Fulton Rd., Cleveland 13. This fastener eliminates all screws, nuts and rivets, as well as tools for attaching. The clip is self-retaining and need only be snapped by hand into prepunched holes in the sides of the box. It is low in cost, light in weight and installed quickly. By merely flipping the clips into locked position, the cover is held firmly in place. These clips are entirely outside of the box with nothing inside to obstruct or damage wires or other equipment.



Core Drills

SPECIALLY designed carbide-tipped core drills, specifically intended for use in drilling hard scaly cast irons such as rough cast exhaust manifolds, have been announced by *Tungsten Carbide Tool Co.*, 2661 Joy Rd., Detroit 6. The core drills are not carried as stock items since dimensional requirements of different applications limit standardization to general design. The new TCT core drills are the result of a study of the effect of various carbide grades, tool shapes, shank materials, tool angles, number of flutes, etc., on the life expectancy of tools under such conditions. It is said that the new drills are giving, in one application, a life of some 10,000 holes 1⅝ in. diam, ⅝-in. deep, between grinds, equivalent to continuous production for seven days with two 9-hr shifts per day. In breakdown tests, as high as 50,000 pieces per grind were obtained with the TCT core drills, although this practice is not recommended by the company.



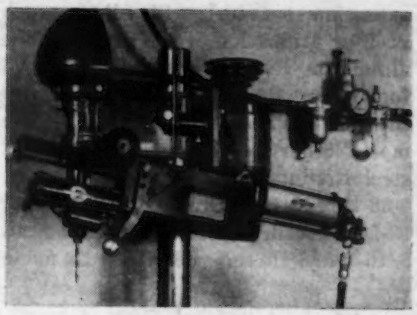
Indexing Head

IMPROVEMENTS in their indexing head, Rotab, have been announced by *Machine Products Corp.*, Detroit 12. A change has been made in the design of the minute control dials. By having the verniers positioned on the same axes with the rotating members, perfect synchronization is said to be achieved. The vernier for rotating the table is located directly underneath the table. The vernier for the angular tilt of the table is located opposite the gear control where the sine bar can be attached for second readings if required.

The table or faceplate to which the work is clamped can be rotated to any degree and at the same time can be tilted to any angle from the vertical to the horizontal and 30 deg back in the opposite direction. Three sizes of faceplates are available, 12 in., 24 in., and 36 in.

Drill Press Feed

A STEPLESS-RANGE power feed for use on drill presses, milling machines, surface grinders, etc., has been announced by *The Bellows Co.*, 861 E. Tallmadge Ave., Akron 10, Ohio. Bellows-Senacon feeds, at a touch of the handle, advance work or tools a pre-determined distance, under a pre-determined power thrust, and automatically return to starting position. Precision controls for feed and traverse rate, for power thrust, and length of stroke are simple and positive. This feed operates on any air pressure up to 160 lb, delivering a power thrust approximately five times operating air line pressure. Feeding rate can be adjusted to fit perfectly the needs of stock or tool. Simple adjustment of the two throttle valves permits unlimited variation of feed and retraction speed in a stepless range. Advance may be so slow it is barely discernible, the return as fast as desired. These feeds are made in two sizes, model DF-60 and model DF-90.



Drill Chuck

A TYPE of heavy duty drill chuck, in which a tough web of neoprene synthetic rubber keeps the jaws in better alignment and permits one chuck to take a wider range of drill sizes, has been announced by the *Jacobs Mfg. Co.*, Hartford. In its function, the resilient material replaces the flexible spring steel collet shank of the traditional single purpose type of drill chuck. The rubber is bonded to the steel jaws and passes through anchoring holes in them, a design which makes the collet or inner socket of the chuck a compact, conical unit. The Rubber-Flex Collet, as it has been named, is tightened by a screw mechanism which forces it forward into the smooth funnel-shaped nose of the chuck.

OILGEAR POWER'S GENTLE TOUCH

Oilgear Fluid Power Units of this type are used for roll hold-downs and lifts on many types of paper machines.

Short fine "hairs" of cellulose actually floating in water are what paper is made of. Matted together in a moist, fragile web they are passed through successive rollers. Each set of rollers squeezes more water out until finally the substance is recognizable as paper.

But what precision of controlled and irresistible power is needed in the opposing rollers . . . not only to preserve the fragile web hundreds of feet long but to insure uniform moisture extraction and unvarying calibration of thickness.

Here, and on other types of paper machines and printing presses, Oilgear Fluid Power hold-downs and lifts maintain that important squeeze indefinitely at any degree of exquisite fineness. There's independent pressure adjustment for each end of roller from a convenient panel. There's power to lift and hold up the rolls. Yes, the positive action, the steady preset pressure, the utter controllability of force, smooth gliding acceleration and deceleration make Oilgear Fluid Power the ideal solution to straight line and rotary power transmission problems. You should know what Oilgear can do for you; you should not wait. . . . Write THE OILGEAR COMPANY, 1303 W. Bruce Street, Milwaukee 4, Wisconsin.

ARE YOU TRYING TO:

1. Apply large forces through long . . . or short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with or without preset time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R.P.M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full preset automatic control, elimination of problems of shock, vibration, etc.?

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OILGEAR

Fluid Power

Assembly Line . . .

STANLEY H. BRAMS

• Reconversion hump has been reached and passed in automobile industry . . . Passenger car production is now above 1400 cars daily, with next month due to see 120,000 assemblies, barring big strikes.

DETROIT — Reconversion is largely behind the automobile industry. Production of new Passenger cars is proceeding today at a rate of approximately 1400 units daily, in addition to approximately 750 trucks per day. By next month, barring major strikes, the output rate will go past a level of 6000 per work day. The industry will reach peak 1946 model production early next spring.

Ford has swung back into output following its resumption at the end of the Kelsey-Hayes Wheel Co. strike, and is building upwards of 400 passenger cars a day. All General Motors divisions are now in final assembly, building upwards of 600 units per day between them; and Chevrolet civilian truck output is now at a level in excess of 1150 units daily.

General Motors production prospects were outlined at a lengthy press session attended by C. E. Wilson, president, and other company luminaries last weekend. Between them they reported that production next month in General Motors would total around 85,000 vehicles. Most of them expect to reach their 1946 model peak in February or March, at which time the companies aggregate will be about 250,000 vehicles. A breakdown of the schedules for November and next February or March (depending on which is the peak month) may be of interest:

	Nov.	Feb.-Mar.
Chevrolet p.c.	19,000	100,000
Chevrolet trucks	41,000	46,000
Buick	10,000	36,000
Pontiac	6,000	30,000
Olds	4,000	26,000
Cadillac	2,000	5,000

Including anticipated output of GMC Truck & Coach, a figure of 85,000 vehicles for November and 250,000 for March is reached.

Chevrolet's postwar peak will run far higher than its anticipations for next spring. As of next October it expects to be producing 6800 passenger cars and 2300 trucks per day on two 8-hr shifts, as contrasted with a peak of 6000 per day before the war. This would enable the division to build around 2,000,000 cars during a calendar year. But for the time being only two passenger car plants are running, at St. Louis and Kansas City. Norwood will soon begin.

The new Flint assembly plant, which will be capable of turning out 50 cars per hr, will not be completed until July. By that time Chevrolet expansion expenditures probably will total in the neighborhood of $108 million.

At Chrysler Corp., first pilot models are being assembled in the Plymouth Div. plant at Detroit, and indications are that regular production can start in a limited way before the end of this month, provided strikes in key supplier plants do not interfere. The rest of Chrysler Corp. it appears, is about in a parallel position.

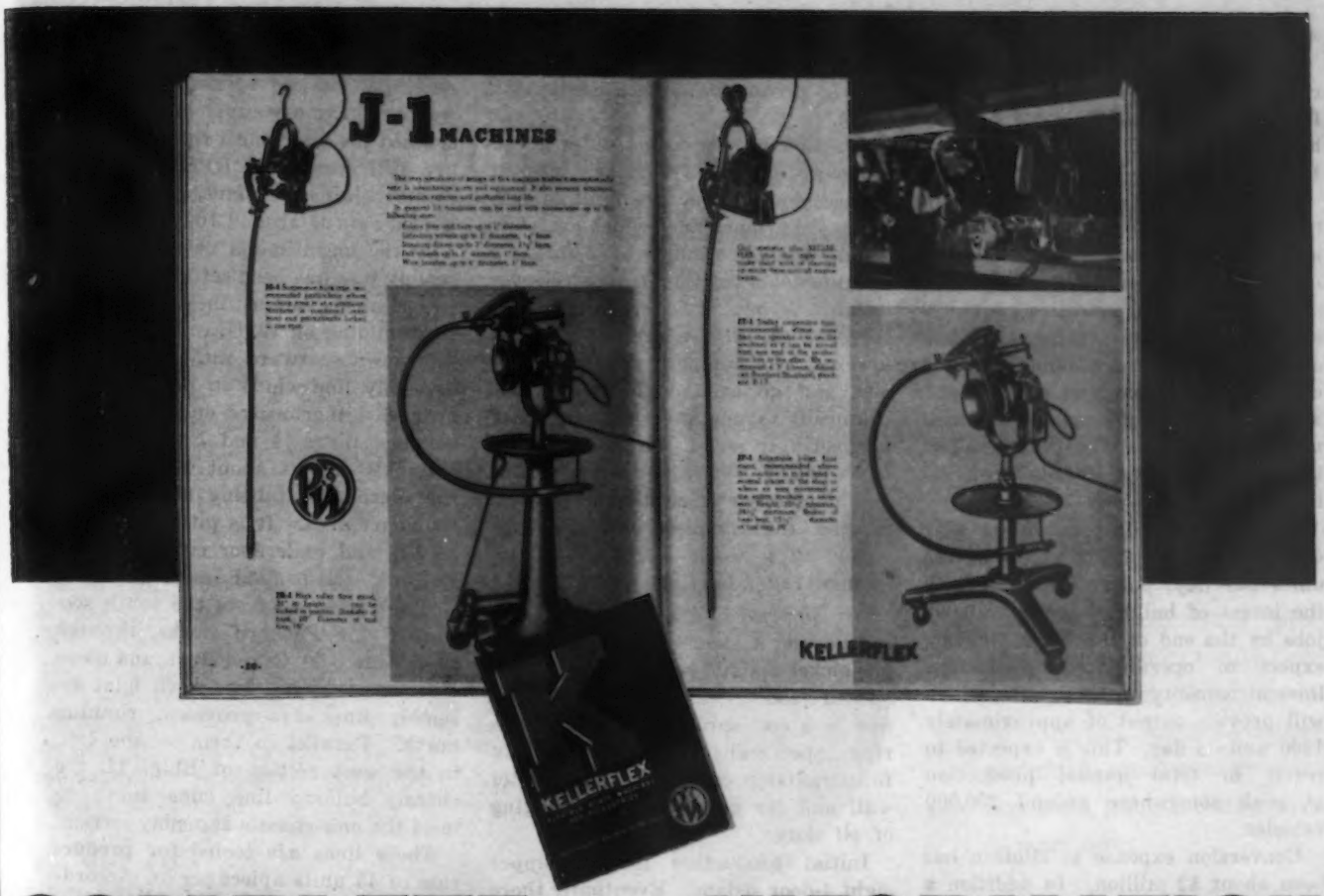
A WALK through Plymouth last week established that facilities are going to be less crowded than in the past. A new section of the factory, built originally for increased output of tank parts, has now become the engine block machining department, and removal of equipment to this section has permitted some elbow room in the rest of the division. Conceivably this modest availability of space will permit increase of output above the prewar rate of 45 jobs per hr on each of two lines during the day shift and the same quantity on one night line.

The engine line, which normally produces 3150 powerplants daily is already operating at a rate of about 700. These go into pickup and half-ton trucks as well as Plymouths.

Postwar planning in Chrysler calls for a somewhat larger proportion of body manufacturing to be placed on Briggs, so relieving the hard pressed body facilities at Dodge. Briggs will make more than half the Plymouth bodies henceforth.

The entire Chrysler company is pretty well beyond its reconversion problems. Of 6693 government ma-

NEW HUDSON COMMODORE: *A diecast grille, heavier than before, highlights the front end of the new Hudson. Bumpers are longer and extend around the side, affording greater strength and additional protection. At center is a newly designed adaptation of the Hudson triangle emblem; and the plastic bonnet ornament on all models is of new design.*



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chine tools to be moved out of the facilities, about 4500 have already been moved; at Plymouth 835 out of 1357 have been taken out.

In all, Chrysler is spending $57 million in reconversion expense plus $18 million in extensions to present buildings. Its program, fairly advanced at this time, calls for retooling of 18,090 machine tools of the company used in government work; tooling of 974 others bought from the government, and tooling of 1256 more purchased new from builders. Most of these latter machines have already been delivered.

Production at Hudson Motor Car Co. is now at a rate in excess of 115 units per day, pointed upward with the intent of building at least 10,000 jobs by the end of this year. Officials expect to operate two production lines at capacity on two shifts, which will provide output of approximately 1000 units a day. This is expected to result in total annual production at peak somewhere around 250,000 vehicles.

Conversion expense to Hudson has been about $2 million. In addition a similar amount has been invested in plant improvements. Further improvements are in mind which will cost about $2 million or more.

Packard Motor Car Co. is the latest to release details of its 1946 model, which was scheduled to go into regularized production on Wednesday this week.

The new models do not differ greatly in appearance from their prewar predecessors. They are built largely along the Clipper lines which exercised such a dominant influence in thinking on automobile styling before the war began. A new styled radiator grille is provided, the radiator emblem is lowered, and bumpers are more massive and go around the sides. Mechanically, a new steering gear is of interest. It is of worm and triple tooth design, with the roller mounted on a double row of needle bearings extending the complete width of the roller. The worm operates on two tapered roller bearings.

An improved crankshaft bearing consists of a steel shell with a copper-nickel matrix impregnated with a special babbitt bearing material. Also new is a coil spring expanded piston ring, specifically designed for uniform radial pressure on the cylinder wall and for elimination of clogging of oil slots.

Initial production is on Clipper eight 4-door sedans. Eventually there will be four lines of cars, the Packard six, the Packard eight, and the Super eight, the latter in standard and deluxe models.

Packard has done considerable revamping of its factory facilities, largely under the pressure of stark necessity induced by the quantity of war production equipment which has clogged the plant until recently. There are still some 2000 DPC owned machine tools in the plant, going out at a good rate of around 100 a day or so.

In the meantime, a new chassis assembly line has been set up in Bldg. 1 immediately behind the Administration building on W. Grand Blvd. This line flows eastward into a new final assembly line which in part occupies an area hitherto used only as a court between Bldgs. 1 and 12. This new assembly line is about 1000 ft long, the south 400 ft being new, built in the court area. It is pitted along its length, and underfloor conveyor belts feed material to final assembly points. Bodies will come from the south section of the Packard works, through the bridge over Grand Blvd. and down from the ceiling. Two such final assembly lines are provided, running north. Parallel to them on the left, in the west section of Bldg. 12, the chassis buildup line runs south to meet the new chassis assembly section.

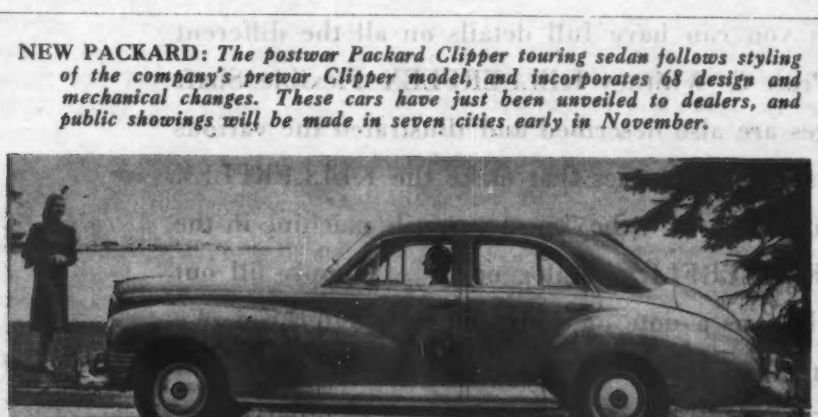
These lines are tooled for production of 45 units apiece per hr. Accordingly, in an 8-hr day it will be possible to produce 720 cars, thus bringing into ready focus the Packard goal of 200,000 assemblies annually.

Bodies are being currently furnished by Briggs and will continue to be for some time, inasmuch as Packard lacks some 200 pieces of press equipment sold to other war contractors and replaceable only over a considerable length of time. Probably the first step in the reactivation of the stamping facilities which occupied the works south of Grand Blvd. will be reinstallation of fender and bonnet presses, but this is probably at least one model year away.

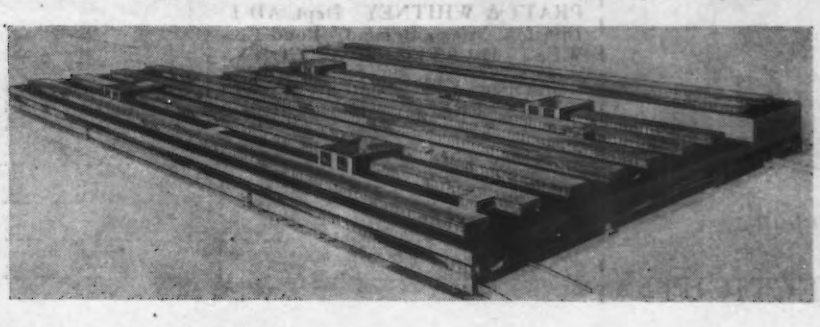
Simultaneously with this resumption of passenger car production Packard is continuing its Navy boat engine contract, which will run until next summer. About $10 million in marine engines remain to be delivered. Completion of this contract necessitates the retention of heat treating furnaces near the north end of the final assembly line as now constituted. These furnaces will be torn out when this work is done and the area made into an inspection bay.

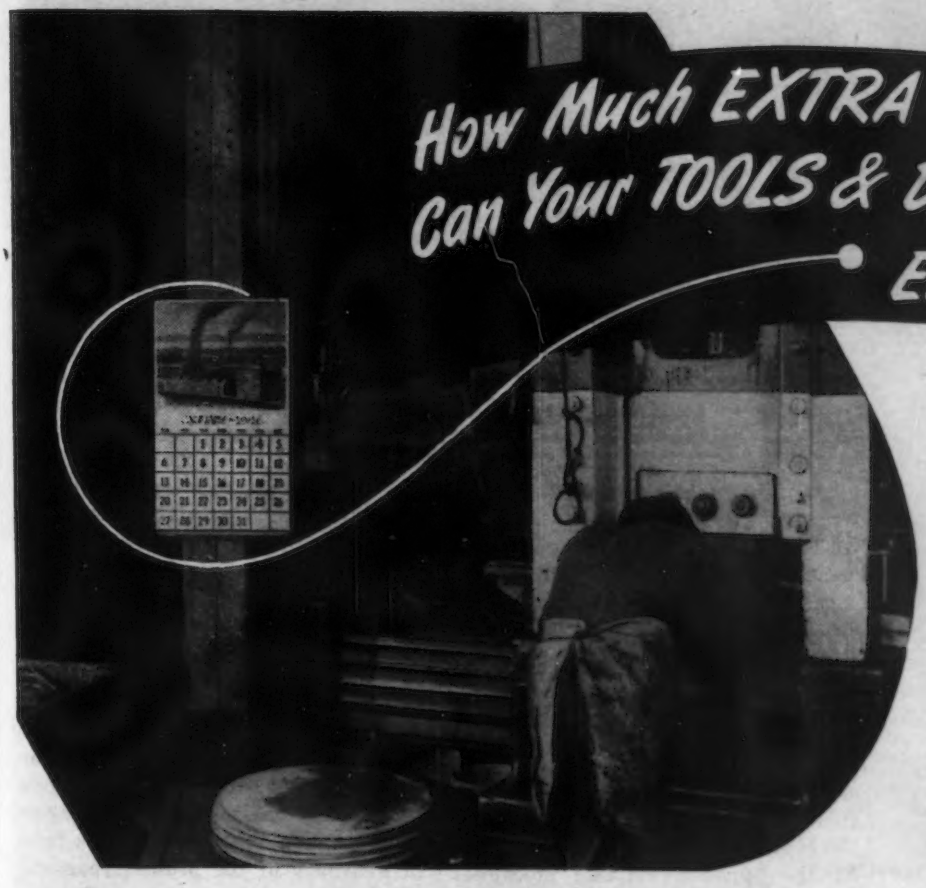
Packard, in common with Studebaker, has submitted cost figures to OPA on which to determine 1946 model prices. They show that actual manufacturing costs of the company have increased 17 pct since 1942. Labor has gone up 12 pct, while some components have risen 40 pct or more.

NEW PACKARD: *The postwar Packard Clipper touring sedan follows styling of the company's prewar Clipper model, and incorporates 68 design and mechanical changes. These cars have just been unveiled to dealers, and public showings will be made in seven cities early in November.*



NEW GMC PLANT: *Ground has been broken for this new coach assembly plant being built at Pontiac, the first unit in an extensive expansion program.*





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Proper heat treatment is the second step to better tools that cut costs. To get the heat treating results you want, use the "Matched Tool Steel Manual". It contains the most complete heat treating information available in printed form. And as a special help to your heat treaters, we have prepared a handy slide chart that condenses the basic heat treating information and puts it in easy-to-use form. Drop us a line and let us know how many Carpenter heat treating slide charts you will need.

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Follow each tool set-up on the job. Check the reasons for any premature failure or too frequent regrinding. You'll soon spot new ways to make your tools save production time—and money. And when you want personal help with a tooling problem call on your nearby Carpenter representative. He really knows tool steel and can help you reduce costs all along the line.

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Washington . . . .

L. W. MOFFETT

• August shipments in steel drop 13.7 pct, due to war cancellations . . . "Salvageable" ammunition dumped in lake as a safety measure, says army officer.

WASHINGTON—Reflecting the impact of the end of the war, iron and steel shipments in August dropped 13.7 pct under those of July, declining to $1104 million from $1281 million. Shipments of nonferrous metals fell off 11.6 pct to $434 million from $491 million and machinery shipments decreased 10 pct to $1463 million from $1626 million. Transportation equipment including automobiles declined 13.8 pct to $1693 million from $1966 million.

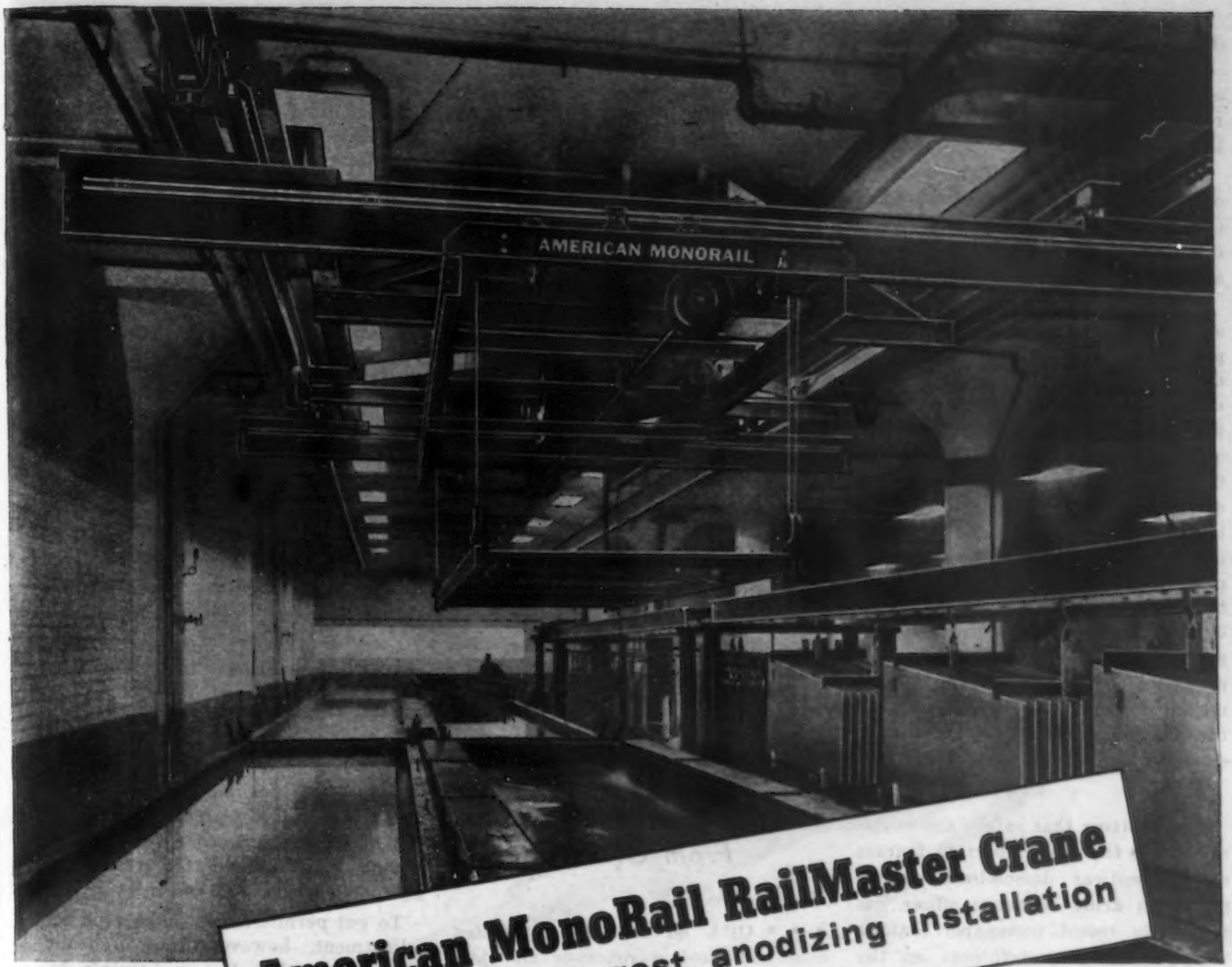
These facts were disclosed by *Industry Survey* published by the Bureau of Foreign and Domestic Commerce in a report on the diverse effect of the war's end on manufacturers' inventories, shipments, incoming business and unfilled orders.

The overall decline in August shipments, estimated at $11 billion, was 4 pct. Inventories were estimated at $16.3 billion or practically the same as at the end of July. Contrariwise to the general liquidation of inventories in the durable goods industries, those of the iron and steel industry were increased for the fifth consecutive month with an index of 123.6 for August compared with 121.2 for July, 100 being the average month for 1929. At the opposite extreme stockpiles held by the automobile industry decreased 6 pct to 203, indicating that the continued liquidation of war stocks was not offset by accumulations for civilian production. Indexes in August for other durable goods compared with those for July, the latter being in parentheses, were: Nonferrous metals, 147.4 (145.5); electrical machinery, 305.2 (314); other machinery, 209.5 (209.8); transportation equipment, 793.1 (791.5).

As in other durable goods industries the net value of new business placed with the iron and steel industry dropped precipitously about one-third to an index of 106 from 175 in July. The net value of new business placed with all durable goods industries in August dropped to about two-fifths of the orders placed in July. This decline was about three times as large as the drop which occurred from April to May following VE-Day. These two periods of accelerated rates accentuated the steady decline in the net amount of new orders received by the durable goods industries which began in March. The estimated value of new orders, less cancellations, in August was about half that of the peak level in February of the present year and about the same as that of October 1940.

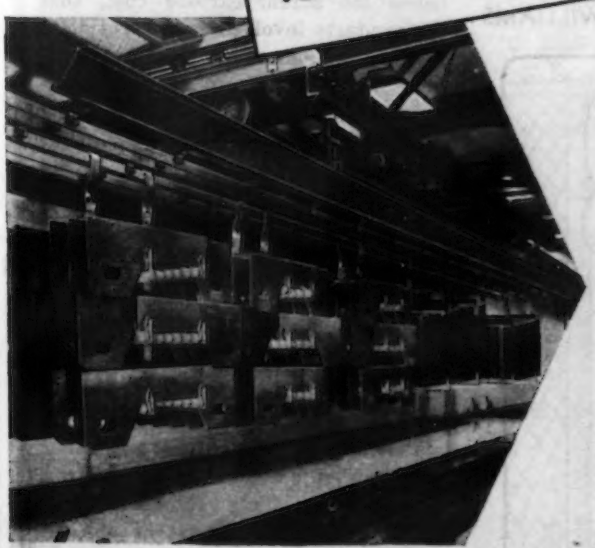
CANCELLATIONS exceeded new orders in all the machinery industries. Blast furnace orders, however, actually increased. To a large

PRESIDENTIAL POW WOW: *President Truman, seated in the center, met with members of the War Labor Board recently. Front, left to right: Frank P. Graham, public member; John W. Snyder, Reconversion Director; President Truman; Lewis B. Schwellenbach, Secretary of Labor; Lloyd K. Garrison, public member. Standing left to right: John Leonard, AFL, labor member; Vincent Ahearn, industry member; Edwin Witte, public member; Carl Shipley, CIO, labor member, Nathan P. Feinsinger, public member; Neil Brant, CIO, labor member; George Barrs, industry member; Clarence Skinner, industry member; Lewis M. Gill, public member; E. Cannon, industry member and Ray McCall, AFL, labor member.*



Special RailMaster 38' Crane with 2-way tractor drive.

American MonoRail RailMaster Crane feeds nation's largest anodizing installation



Loaded rack on crane ready for anodizing.

AN American MonoRail two-way drive Rail-Master Crane operates over six tanks that make up one of the world's largest anodizing installations. Special racks loaded with parts are lifted from one to another of five cleansing and rinsing tanks and then deposited into a chromic acid tank where the actual anodizing takes place. Some of the loads weigh as much as 3 tons.

American MonoRail Railmaster Cranes of extremely simple design are developed for handling loads up to 5 tons by manual operation or propelled by rubber wheel drive.

With thousands of installations to draw from, American MonoRail Engineers are well qualified to offer solutions involving overhead handling equipment. Consultation with these men will reveal why American MonoRail equipment was selected to serve the nation's largest industrial plants. This service is offered without obligation — we invite your inquiry.

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extent, the report said, this increase represented the inflow of civilian business.

Contrary to the situation in the durable goods industries, it was pointed out, demand for the products of nondurable goods industries as a group has been and is strong.

"The general trend during the war of the relative positions of the durable goods and the nondurable goods industries with respect to inventories was much the same as with respect to shipments," the report said. "As of August the durable goods industries yet accounted for more than half of the total value of inventories, but the trend since the peak of almost 60 pct in 1943 has been downward. Data prior to 1939 are not available, but in that year less than half, 47 pct, of the value of inventories in the hands of manufacturers was in the durable goods industries. As in case of shipments the downward movement for the durable goods industries may be expected to continue."

* * *

Emphasizing that safety and economy will be the most important feature of its postwar demobilization program, an army ordnance officer has replied to recent newspaper articles that intimated wastefulness on the part of the army because "thousands" of rounds of "salvageable" ammunition were dumped daily into Lake Superior. Actually, it was stated, the Army saved $20,000 by thus disposing of unsafe incendiary bullets and incompleted cartridges. Previous experience was pointed to as having shown ordnance safety and security experts that burning "hot" ammunition involves great personal danger.

In most instances the brass cartridge cases are salvaged but ordnance men have found that little material can be saved by burning unserviceable ammunition. War Dept. agents have established a thorough liaison with commercial firms to check possible use by them before disposing of any type of harmless ordnance equipment.

Certain types of magnesium used only in incendiary bombs will soon have to be destroyed at the Ravenna, Ohio, ordnance plant. Other types can be used by commercial companies in the manufacture of flares, but there is more than enough of the magnesium used exclusively in the manufacture of incendiary bombs left since the war to last the military for 100 years. To keep these huge piles of excess materiel, it was pointed out, would constitute waste of storage space as well as a potential fire hazard.

Decontamination of huge explosive plants was started the day after the war with Japan officially ended. Lumber from explosives or ammunition buildings must be thoroughly decontaminated or it may prove to be a potential source of real danger when sold for salvage because a hammer blow on a nail head can cause an explosion unless every trace of explosive is obliterated from the lumber. Under the direction of safety experts, some plants will have to be burned.

Aids Iron and Steel Warehouses in Buying From Other Sources

Washington

• • • OPA on Oct. 17 authorized iron and steel warehouses and jobbers, who are unable to get products from their usual suppliers, to apply for increased ceilings to cover the actual carload costs incurred in buying material from other sources and having it processed for resale at another location.

To get permission to make such an adjustment, however, the applicant must state that he was unable to obtain the products from customary sources, that established ceilings are below his actual carload cost, that the products involved are essential to a peacetime economy and that they were not bought from another warehouse or jobber.

OPA said that in some cases resellers are unable to obtain from the mills the particular kind of iron and steel required. As a result, they are obliged to buy unfinished material and have it processed elsewhere at additional cost. Purchase orders for iron and steel that will be warehoused before resale must show that the material is "for resale from stock."

The reason for this, OPA explained, is that WPB's regulations governing purchases of particular types of iron and steel products for resale no longer apply. OPA must be able to determine if the product was purchased for resale, in which case it would bring higher prices than if it was purchased for use and sold as excess stock at the mill level of price. The endorsement provision is an adaptation of the previous WPB requirement for marking purchase orders.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

"PICCOLO PETE" THE INSPECTOR

THIS Sheffield Precisionaire which reminded the purchaser of a piccolo, checks a tapered bore at ten points. Inside the spindle a plunger type valve directs the air flow through one pair of diametrically opposed orifices at a time, thus making it possible to check each of the ten points in sequence.

The tolerance markers on the base instrument are set to the maximum and minimum master chambers (illustrated). In inspecting the work part the spindle is inserted into the bore and each of the ten points checked progressively. If the indicator remains within the length of tube between the markers throughout the inspection, the part is acceptable. If not, any error is immediately located.

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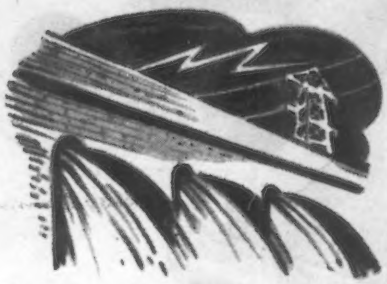
West Coast . . .

OSGOOD MURDOCK

• Gilmore interest in Pacific States Steel bought by partner Joseph Eastwood and American Forge Co. . . . Cyrus Eaton and Henry Kaiser plan securities issue to pay Fontana-RFC loan in full and buy Geneva.



SAN FRANCISCO — Realignment of the Pacific Coast steel industry continues as officials of the American Forge Co., Berkeley, confirm the purchase of the Gilmore holdings in the Pacific States Steel Co. at Niles, Calif., and trade talk reports that Gilmore Steel & Supply intends to supplement its San Francisco warehouse with one in Los Angeles.

Pacific States was founded in 1937 in the East Bay district in the old N Clark clay and pottery works by Joseph Eastwood, Jr., president of the American Forge Co., and William Gilmore, head of the aggressive warehouse concern. This team was described as an ideal combination at the time of the amalgamation, as Mr. Eastwood was known as one of the Coast's top production men and Mr. Gilmore, one of the most ingenious business-getters.

The American Forge Co. is the outgrowth of the old Day & Pracy smithy founded in San Francisco in 1888, which subsequently became the American Tool Works and finally the present corporation. It is the largest exclusively forging company on the Coast and houses the largest press west of the Mississippi.

Unlike the long and solid record of American Forge, the young Pacific States mill at the time of its organization was generally said to have bitten off more than it could chew. However, the confidence of its founders appeared justified when it developed that six months more would probably have made its building impossible. Again the viewers-with-alarm thought they were right in early 1939 when market conditions for reinforcing bars were giving the Coast independents tough sledding, but with the advent of war the increasing volume of building activity supplemented by government additions to the plant became what was described at the time as a life-saver.

The mill is understood to have stopped rolling reinforcing bars two years ago and is now turning out merchant bars, flats, angles and forging quality ingots and reports have it that the Eastwood management plans to confine the output of the new furnaces to electric furnaces for stainless.

While officials of the company confirm the transaction, top executives were not available for comment. It is understood that final details will not be settled for some time as the government-owned facilities may require negotiation.

* * *

THE growing volume of what is termed loose talk concerning West Coast freight rates is doing the region more harm than good, in the opinion of many business men. Eastern manufacturers looking for Coast industrial sites lose little time in coming around to this aspect of the western economy. As a consequence officials of the western rail lines are preparing a statement to be issued which is intended to alleviate the impression created by the self-appointed saviours of western industry.

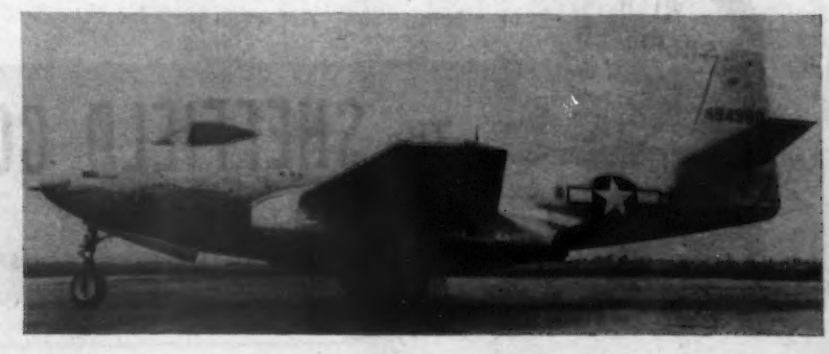
The railroad officials will remind interested parties that one of the primary jobs of a railroad is to encourage the growth of industry as a matter of sheer self interest. Slanting their joint statement directly at Utah and the Rocky Mountain states, they will emphasize the necessity for careful study of the adverse effects of a rate reduction in the opposite direction of that applied for. The statement will stress the fact that industry must first locate in an area before applying for a rate comparable to that granted to a high volume area. They will also point out that it is foolish to speculate about a new rate for Geneva until there is some concrete evidence as to the level of future water freight rates.

In evidence of the equability of existing Rocky Mountain rates the roads refer to the present 60c rate from Geneva to San Francisco, a distance of 855 miles and compare it with other comparable rates as follows:

	Miles	Rate per 100 lb
Chicago to Sidney, Neb.....	893	83¢
Chicago to Garden City, Kan....	839	80¢
Birmingham, Ala., to Giddings, Tex.	850	83¢
Birmingham to Olney, Tex.....	851	84¢
Minnequa, Colo., to Navasoto, Tex.	858	80¢
Minnequa to Little Rock, Ark...	865	90¢
Bethlehem, Pa., to Chicago, Ill..	855	60¢

The railroads' statement will explain that the Geneva rate is geared to meet the Utah to Missouri River rate and beat the return-by-water rate giving the Mountain region a 25 pct advantage on existing commodities and in special circumstances

BELL'S NEWEST: *Bell Aircraft Corp. has unveiled the Army Air Forces' newest high-speed jet propelled fighter plane, XP-83, which is said to be radically different from the company's earlier P-89 airacomet.*



Indispensable

IN OUR TIME

Here is the portrait of an indispensable man . . . indispensable now and in the foreseeable future! Not—for long years to come—can even the cosmic power of the exploding atom take the place of the product he labors to provide.

Just as the coal miner is indispensable to Industry, so, also, are clutches and hydraulic drives essential to the efficient transmission and control of power in modern industrial equipment and machinery.

For 27 years now, Twin Disc has *specialized* in the manufacture of *proved power links* for almost every conceivable industrial application. In this diversified service, these Twin Disc Clutches and Hydraulic Drives have established a sound reputation for long wear-life and reliable, trouble-free performance . . . easy service and low-cost maintenance.

If you are faced with new problems involving the linkage of driving and driven units, why not seek the counsel of Twin Disc Engineers? Their long years of specialized experience may prove profitable to you in finding the right solution. Write TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).

SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

considerably greater reduction. While it does not touch on the "equal rates for equal mileage" philosophy, the statement is intended to discourage the patient from yelling before the tooth is pulled.

* * *

THE anticipated boom in the steel business—generally expected to last for the next three or five years—is beginning to have a peculiarly paradoxical effect on the executives and personnel of the Coast offices of Eastern mill representatives. Instead of looking forward with enthusiasm to the impending rush of business, many are examining the underlying policies of their own home offices in an effort to assay their probable future course.

The riddle boils down to the old question of intensive or extensive sales development. Their thinking goes something like this: "In the light of the past performance of my company are we liable to sell everything we can produce in our own backyards in the East where we have no freight absorption? Or are we going to remember that there always comes a day when tonnage means we meet our break-even point or fall below it? Am I liable to find myself an orphan out here when the rush sets in? Are they (the home offices) liable to close us up one fine day?"

Some of the worrying falls into the crossing - the - bridge - before - you-get-to-it category, but one firm is already turning down orders on plates —which the coast can produce in volume. Another has cut its midwestern office in half and local officials believe that they are next. On the other hand, Republic, which manufactures a full line, anticipates no change in policy locally. Nevertheless, many officials of Eastern firms would like some definite assurance regarding their firms' future policy.

* * *

APPARENTLY flushed with success at the enthusiastic oversubscription of the Kaiser-Fraser stock flotation, the Kaiser interests will announce this week that they hope to repay the Fontana-RFC loan in full, in cash. Financing method is to be a flotation of securities to the public. The announcement comes on the heels of an inspection trip by Cyrus Eaton, head of Otis & Co., to explore potentialities of the Coast steel market in person. Present Kaiser-Eaton plans include both Fontana and Geneva, although the latter can be excluded at a moment's notice.

In the event that the contemplated financing does not include Geneva, Mr. Kaiser is expected to offer the Geneva studies of his research dept. to any other interested people. Executives of the Kaiser companies feel that continued operation of Geneva is vital to the steel economy of the West.

Asked if they believed that people would buy into a prospective price war, officials of the company replied, "Yes. If properly financed they will —so long as it's only a price war and not a massacre."

* * *

LOS ANGELES — Southern California aircraft companies are resuming a drive for workers which has all the characteristics of flush production times in the early stages of the war. Douglas, Lockheed and North American are starting a campaign to recruit almost every type of employee from the professional categories to unskilled. These companies find themselves especially short of engineers, designers, stress analysts, milling machine operators, riveters, sheet metal workers and other production employees.

This worker shortage comes simultaneously with mounting unemployment relief rolls which have passed the 150,000 mark in California. Immediate payroll reductions at the time of war contract cutbacks and cancellations underestimated the continued need for professional and skilled employees which would result from the rapid obsolescence of supposedly new planes.

Complicating factor to employment recruiting (in both northern and southern California) is the increasingly acute shortages of housing facilities. Employers, even though able to find employees, are unable to assure them of adequate living conditions.

* * *

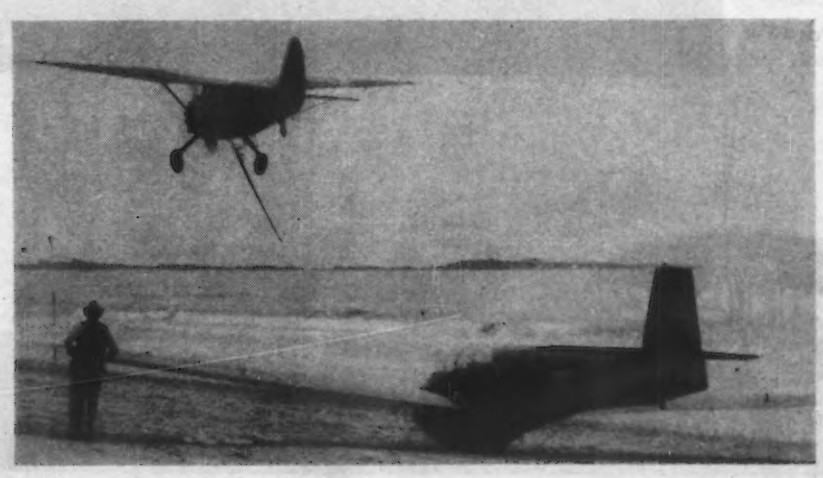
A prospective operator of the Los Angeles Alcoa and Bohn aluminum plants appeared last week in the person of Arnold Troy, co-owner of the Eastern Metal Products Co., at Tuckahoe, N. Y.

On an inspection tour of the two plants Mr. Troy outlined plans for the operation of the $27,000,000 Alcoa plant and Bohn's $7,000,000 establishment, now shut down by the DPC. Mr. Troy sketched a project to produce aluminum from the alumina of bauxite ore, and in addition the rolling, forging, extrusion and foundry operations by which the metal is made ready for fabrication. Mr. Troy expressed the belief that the pattern established in the steel industry at 60 pct under cost could be considered fair.

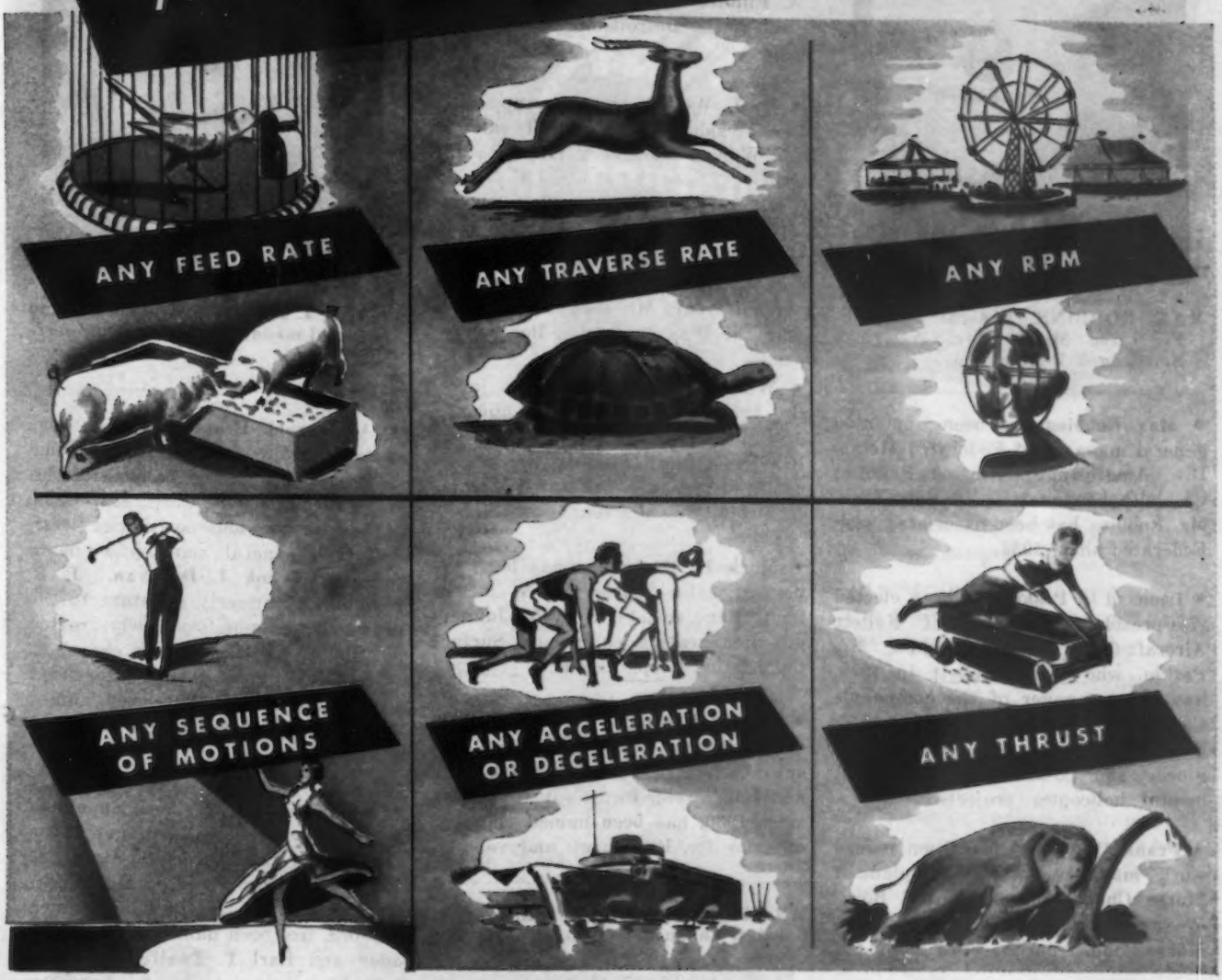
* * *

An independent division of Lockheed Aircraft to design, manufacture, and merchandise airplane ground handling equipment and service tools is being organized. The company's name is to be the Airquipment Co. and will be headed by C. P. Turner and Newman L. Smith of Lockheed. Intending to operate all over the world, the company also contemplates service equipment for bus and trucking lines.

COMMERCIAL PICK-UP: *A plane swoops low over the beach at Hull, Mass. to pick up a glider by snatching rope strung between two poles with hook suspended from ship, claimed by All American Aviation, Inc. to be the first commercial glider pick-up freight route. Flights take two hours and are planned daily.*



VERSATILITY that *Exactly* meets your needs in MACHINE TOOLS



Machine tool design is set free from a host of limitations when Vickers Hydraulic Controls and Drives are used. With no difficulty at all, the designer has an extremely wide choice of feed rates, traverse rates, RPM, sequence of motions, accelerations or decelerations, and thrusts.

Practically any machine tool can be designed *and built* to do *exactly* the required job by using Vickers Hydromotive Controls in one of the infinite number of combinations provided by more than 5000 standard Vickers Units.

In addition, positive overload limitations can be built into any machine—definite safety factors provided for both the machine and the operator.

Only Vickers Hydraulic Controls provide *all* the advantages of hydraulic operation—including exceptional compactness and reliability.

Let Vickers Application Engineers consult with you on your new designs.

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

PERSONALS

MAX ROBBINS, general manager, Federated Metals Div., American Smelting & Refining Co.

• **Max Robbins** has been appointed general manager of Federated Metals Div., American Smelting & Refining Co., with headquarters in New York. Mr. Robbins has been associated with Federated since 1936.

• **Leonard C. Peskin** has been elected vice-president—contracts of Kellett Aircraft Corp., Upper Darby, Pa. Mr. Peskin, who joined Kellett in 1943, has been manager of the company's Contracts Div. since August 1944. Previously he had been products engineer and co-ordinator of experimental helicopter projects.

• **Frank C. Tippery** has been named works manager of the Ithaca plant of Morse Chain Co., division of Borg-Warner Corp. Mr. Tippery comes to Morse Chain from the Ford Motor Co.

• **Dr. Roy E. Heath** has been placed in charge of the industrial sales dept. of the J. B. Ford Div. of Wyandotte Chemicals Corp., Wyandotte, Mich. Dr. Heath, who assumes his new duties Nov. 1, will be associated with W. M. Cole, former head of the department, who is retaining his connections with the company for an indefinite period.

• **Clyde R. Paton,** recently director of automotive engineering at Packard Motor Car Co., has been named a consulting engineer by the Ford Motor Co., Dearborn, Mich.

• **Paul V. Osborn,** assistant to the vice-president of Timken Detroit Axle Co., Detroit, has been elected vice-president in charge of manufacturing.

o o o

• **R. E. Pauling** has been named manager of the Tulsa, Okla., office of ILG Electric Ventilating Co. **Marion A. Elliotte** has been appointed to the staff of the Detroit office of the company.

• **E. J. Welker** has been appointed vice-president in charge of sales of the Welker Machinery Co., Inc., Detroit.

• **H. L. Hunter** has been appointed special sales representative of Cans, Inc., Chicago. For the past three and one-half years Mr. Hunter has served with the War Production Board.

• **William E. Klingeman** has joined the Precision Welder & Machine Co. of Cincinnati as chief engineer. Mr. Klingeman until recently was assistant sales manager of Federal Machine & Welder Co., Warren, Ohio.

• **Mark H. Cummings** has been appointed sales representative in the South Bend, Ind., territory for Janitrol gas-fired heating equipment, Surface Combustion Corp., Toledo.

• **Arthur H. Brown,** who has been associated with Lukens Steel Co. and subsidiaries, By-Products Steel Corp. and Lukenweld, Inc., Coatesville, Pa., since 1930, has been named manager of sales for Pittsburgh and vicinity.

ARTHUR H. BROWN, manager of sales, Lukens Steel Co.

FRANK J. DONOVAN, president and general manager, Kaydon Engineering Corp.

• **A. Harold Frauenthal** has been elevated to the newly created position of chairman of the board of directors, Kaydon Engineering Corp., Muskegon, Mich. His previous position of president and general manager is being filled by **Frank J. Donovan. J. F. Oehlhoffen,** formerly assistant to the president, occupies the newly created position of vice-president in charge of sales. **G. A. Peters,** formerly assistant secretary-treasurer, has been named treasurer, and **Mrs. Pernelle R. Finch,** secretary.

• **Ira B. Groves** has been appointed southwestern regional manager of the Ford Motor Co., succeeding **Harry A. Mack,** who resigned. **J. C. Doyle,** former manager of the St. Louis branch of Ford, has been named acting manager and **Earl T. Zweifel,** assistant branch manager at Chicago, has been transferred to Dearborn as assistant manager. Mr. Doyle replaces **Harold K. Turner** who has been transferred to the executive staff of the Lincoln and Mercury sales organization. **A. G. Coulton,** formerly assistant branch manager, has resumed his former duties at the home office on the executive staff.

• **Fred C. Smith** has been appointed director of quality of Tube Turns, Inc., Louisville, Ky. Prior to joining Tube Turns in January 1943 as chief metallurgist, he was field metallurgist for Carnegie-Illinois Steel Corp.

• **Charles T. Evans, Jr.,** has been appointed chief metallurgist for the Elliott Co., Jeannette, Pa.

Pygmy PARTS or *Giant* CASTINGS

Fairbanks-Morse Scales Guard Accuracy

AT the Manitowoc Shipbuilding Co., Fairbanks-Morse Crane Dial Scales have the unusual job of weighing four-ton ship castings.

In other industries they weigh tiny parts where it takes thousands to make up a ton.

In still other applications, Fairbanks-Morse Scales operate as units in fast-moving production lines . . . or they keep records . . . or help mix formulas.

They can be engineered to operate in Arctic cold or blast-furnace heat. They can be adapted to withstand dripping wetness.

And in every job they're lastingly accurate.

They can help you solve any weighing problems you can think of, and a great many production problems you might not think of. A Fairbanks-Morse engineer will be glad to work with you. Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

BUY VICTORY BONDS

Fairbanks-Morse

A name worth remembering

Diesel Locomotives • Diesel Engines • Generators • Motors • Pumps • Scales
Magnetos • Stokers • Railroad Motor Cars and Standpipes • Farm Equipment

T. S. FITCH, president, Washington Steel Corp.

• **T. S. Fitch** has been elected president of the newly formed Washington Steel Corp., Washington, Pa. The new company will specialize in thin gages of stainless steel strip up to 36 in. wide.

• **Reid B. Gray** has been appointed director of the Reynolds Research Institute, research subsidiary of the Reynolds Metals Co. Mr. Gray succeeds **Dr. Warren J. Mead,** who has resigned and will direct Reynolds research centered in Glen Cove, Long Island, and Richmond, Va. **J. Edward Spike** and **Carl B. Hamlin** have been appointed Mr. Gray's associates. Both will be stationed at the Glen Cove laboratories.

• **Casper J. Sengenberger** has retired as chief accountant at the Waukegan, Ill., works of American Steel & Wire Co. after having been associated with the company for over 45 years. He is succeeded by **Vincent N. Hossack,** who has been with U. S. Steel Corp. subsidiaries and their predecessors since 1920. Prior to his appointment at Waukegan, he had served as chief accountant at the company's Duluth plant.

• **Walter F. Skillin** has been elected president of Union Mfg. Co., New Britain, Conn.

• **Ben Walls,** formerly Tool Purchasing Div. head at Ford Motor Co. under H. C. Kellogg, has been placed in charge of tool stock for the Rouge. **J. W. Durling** has succeeded Mr. Walls in charge of tool buying.

• **John H. Greenland** has been elected vice-president in charge of manufacturing of the Hickok Electrical Instrument Co., Cleveland. **Paul Willour,** who has been controller and assistant treasurer for the past two years, has been promoted to treasurer.

• **Verlin Wright** has been appointed export manager of the Billings & Spencer Co., Hartford, Conn. Mr. Wright's office is located in New Haven, Conn.

• **Richard D. Elwell, recently released** from the Navy, has joined McKinsey & Co., management consultants, New York.

• **Lewis J. Male,** assistant general superintendent of General Electric Co.'s Schenectady works, has been appointed general superintendent. Mr. Male succeeds **Bernhard G. Tang,** whose retirement Sept. 30 concluded over 45 years of service with the company.

• **George H. Tulley** has been named assistant sales manager of the Metals Refining Co. division of the Glidden Co., with headquarters in Hammond, Ind.

• **Dr. Russell A. Nielsen,** formerly a research engineer for Westinghouse at East Pittsburgh, heads the new Pacific Coast high frequency laboratory opened recently by the Westinghouse Electric Corp.

• **William S. Allen** has been made sales manager of the Winchester Repeating Arms Co. and Bond Electric Corp., divisions of Olin Industries, Inc. Mr. Allen has also been appointed assistant sales manager of the Ammunition Div. of the Western Cartridge Co., division of Olin Industries. He will make his headquarters in New Haven, Conn.

• **William G. Succop,** son of the late Clarence F. Succop, has been named to succeed his father as president of American Roller Bearing Co., Pittsburgh. Mr. Succop has been associated with the company for some years in sales and administrative capacities. **Carl Knaak,** long general manager of the company, retains that position and in addition has been elected executive vice-president.

• **LeRoy Keane** has been appointed director of sales of the explosives dept., Hercules Powder Co., Wilmington, Del. He succeeds C. C. Gerow, who has been director of sales since 1919. Mr. Keane joined Hercules as a salesman in 1918.

• **B. M. Davenport** has been appointed to the sales staff of the Philadelphia office and warehouse of A. Milne & Co., and **W. J. Perreault** has been appointed to the sales staff of the Chicago office and warehouse.

• **Nikola Trbojevich,** a native of Jugoslavia and a noted inventor, has joined the engineering staff of Jack & Heintz, Inc., Cleveland, as research engineer.

OBITUARY...

• **George V. Blades,** 61, one of the founders of the Camm-Blades Co., Milwaukee, died from a heart ailment Oct. 8.

• **Sam Moskowitz,** one of Cincinnati's leading scrap dealers, died suddenly last week. Mr. Moskowitz, who was 34 years old, was a partner in the Moskowitz Bros. metal concern. He was a native of Cincinnati and widely known in the scrap business there.

• **Otto J. Vanek,** 58, structural engineer at the American Steel & Wire Co., Newburgh works, died Oct. 9.

• **Walton A. Manson,** 61, a veteran engineer for the American Steel & Wire Co., died Oct. 8. He had been affiliated with the company for 37 years.

• **John D. Cronenweth,** 64, died Oct. 14, in Henry Ford Hospital, Detroit, following a six weeks' illness. Mr. Cronenweth was chairman of the board of Great Lakes Foundry Sand Co.

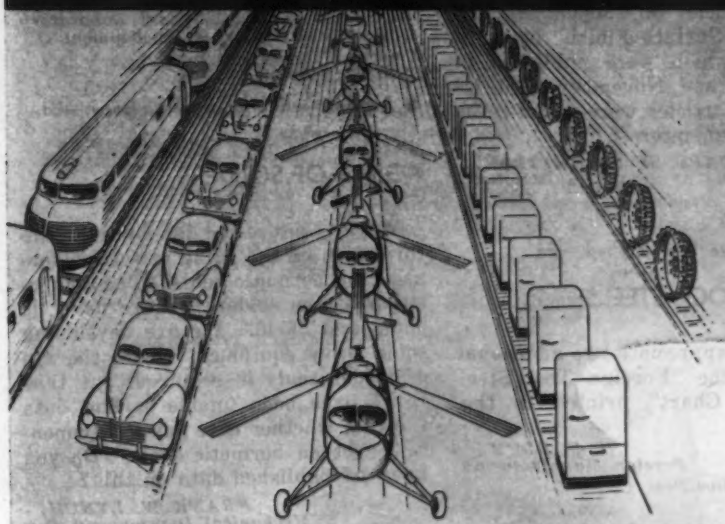
• **Stoddard B. Martin,** owner of the S. B. Martin Co., Cleveland, inventor and distributor of automatic machine tools, died Oct. 5.

• **Augustus Walter Carey,** 77, traffic manager of the Tennessee Coal, Iron & Railroad Co., Birmingham, until his retirement in 1938, died Oct. 11 at Biloxi, Miss., where he had made his home since retirement. Mr. Carey for 38 years had been associated with U. S. Steel Corp. subsidiaries.

• **John X. Farrar,** 56, assistant secretary and advertising manager of the Jeffrey Mfg. Co., died unexpectedly on Oct. 11, at Columbus, Ohio. He had been with the company for 32 years.

MAKE RECONVERSION EASIER

with Broaching by American



A typical set-up of the *American* T-6-24 three way broaching machine is illustrated above. For broaching small serrated holes in carburetor parts a small bridge type fixture is used. A block on top of the bridge locates the part, while the broach is held in location by a pin type broach puller. Production is fast and accurate with fine finish.

Standard equipment, capable of performing a wide variety of different tasks, can naturally eliminate many of reconversion's headaches. Standard *American* broaching machines, designed with this basic fact in mind, are made for maximum flexibility. That is why manufacturers in many industries turn to broaching by *American* to perform their metal finishing jobs.

American offers a complete broaching service—machines, tools, and engineering. *American* engineers will gladly recommend the correct standard equipment for your job, or, if necessary, design special machinery to meet your requirements. For further details, write *American* today. There is no obligation.

Avoid excess load on broaching tools. Do not attempt to broach parts that are improperly prepared.

MEMBER BROACHING TOOL INSTITUTE

American

BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF

Dear Editor:

CARBORUNDUM NOT GENERIC

Sir:

I have noticed in the article "Operation of 4-Ton Openhearth" by H. K. Work and W. R. Webb of the Jones & Laughlin Steel Corp. (Aug. 2, p. 42-43) that our trade mark Carborundum has been used as a common generic term and synonym for the abrasive material silicon carbide.

Carborundum is the registered trade mark of the Carborundum Co. and is used exclusively by us to designate products of our manufacture. This trade mark is used on a variety of silicon carbide products and products made of other materials including garnet, flint, emery and diamond. It is not a synonym for silicon carbide, but is a trade mark which is used to indicate the source of a product. This use of our trade mark as a generic term is therefore incorrect and misleading.

We wrote to your company in regard to the correct use of our trade mark in March of 1941 and received your assurance that you would cooperate with us. I would like to ask again that you do not use our trade mark in any literature that you publish in the future. It would be to your advantage as well to use the correct and accurate term, silicon carbide, when referring to products made of this abrasive material.

W. G. SOLEY,
Patent Attorney
Carborundum Co.,
Niagara Falls, N. Y.

● Sorry. An oversight.—Ed.

CHOOSING CONSULTANTS

Sir:

I would appreciate receiving an extra copy of "Choosing the Consulting Engineer" by George Stuart Brady, appearing in the July 5 issue.

ALFRED N. MILLER,
Consulting Engineer
835 Dominion Square Bldg.,
Montreal, P. Q.

● Tear sheets have been mailed.—Ed.

GERMAN CEMENTED CARBIDES

Sir:

We would like to obtain a tear sheet or reprint of "German Cemented Carbide Industry" by Gregory Comstock, appearing in the Aug. 30 issue.

C. W. BALKE,
Director of Research—Div. 1
Fansteel Metallurgical Corp.,
N. Chicago

Sir:

Would it be possible to obtain copies. . . .

LILLIAN HAUSRATH
Carboloy Co., Inc.,
Detroit

● Tear sheets have been mailed.—Ed.

SURFACE FINISH

Sir:

This Mission would very much appreciate receiving six reprints of the series of articles on "Measuring and Designating Surface Finish" by J. A. Broadston, which were published in the October and November 1944 issues. These articles were found to be of the utmost interest.

CAPT. R. LE CHUITON,
Chief of Staff (By Direction)
French Naval Mission,
Washington 25

● Reprints have been mailed.—Ed.

FOREIGN TOOL STEELS

Sir:

We would appreciate two additional reprints of the "Foreign Tool Steel Comparison Chart" printed in the Aug. 2 issue.

H. F. BLUM,
Foreign Manufacturing
Colgate-Palmolive-Peet Co.,
Jersey City 2

Sir:

We are enclosing 50¢ for five copies . . .

H. J. STAGG
Crucible Steel Co. of America,
Syracuse, N. Y.

Sir:

Please send two copies . . .

D. A. COTTON,
Master Mechanic's Office
Delco-Remy Div.,
General Motors Corp.,
Anderson, Ind.

● Reprints have been mailed.—Ed.

SHOT PEENING

Sir:

I shall appreciate receiving reprint of the article entitled "Mechanical and Metallurgical Advantages of Shot Peening" by O. J. Horger, which appeared in your Mar. 29 and Apr. 5 issues. Enclosed is 50¢ to cover cost of same.

H. E. ERICKSON,
Engineer, Railway Equipment Div.
Nordberg Mfg. Co.,
Milwaukee 7

● Reprints have been mailed.—Ed.

BORING MACHINE

Sir:

There was an error in the article on p. 71 of the Sept. 27 issue, explaining our new model C Milwaukee autometric boring machine. This machine was called an "automatic boring machine," instead of the correct term, "autometric."

G. J. O'HANLON,
Advertising Manager
Kearney & Trecker Corp.,
Milwaukee 14

● We regret this error.—Ed.

METAL FINISHING

Sir:

Please send two reprints of the articles, "Metals, Finishes, and Finishing Processes," by Edward Engel, which appeared in the September issues.

PAUL R. CUTTER,
Electro-chemist
Hanson-Van Winkle-Munning Co.,
Matawan, N. J.

Sir:

I would appreciate a set of tear sheets . . .

F. R. MORRAL,
Metal Trades Laboratory,
Technical Service & Development Div.
American Cyanamid Co.,
Stamford, Conn.

● Reprints available at 50¢ a copy.—Ed.

AGING OF SOLDERS

Sir:

We are interested in obtaining information on the aging of soft solders used for hermetic seals. The composition of the solders we are using is 45-55 and 55-45. We are developing some Navy equipment where the use of solder seals is required, but thus far I have been unable to find data showing whether time has a detrimental effect on hermetic seals. Do you know of published data on this?

FRANK W. LYNCH,
Mechanical Development Div.
Hazeltine Corp.,
Little Neck, N. Y.

● High tin solders of the type you wish to use for Navy equipment have usually shown up very well as regards aging. However, tin restrictions during the war forced the use of substitutes and some of these substitutes show possibilities of being even stronger and less prone to age. However, we know of no published data on aging characteristics to support this observation. A few experiments have been made that lead to the conclusion that 2 pct silver-lead —4 pct tin solder does show greater strength. Unfortunately this solder undergoes some blackening which is undesirable in certain instances, particularly in high sulphur atmospheres.—Ed.

SCRAP CEILINGS

Sir:

Where can a list be obtained of ferrous and nonferrous scrap ceiling prices?

F. BANBERGER
Continental Electric Co.,
Newark, N. J.

● Ceiling prices for ferrous and nonferrous scrap can be obtained from the regional office of OPA at 350 Fifth Ave., N. Y. At the present time, practically all iron and steel scrap is selling at ceilings, and most nonferrous scrap grades likewise. These prices, suitably identified, are to be found in our current scrap iron and steel and nonferrous metal price pages.—Ed.

NICKEL INDUSTRY

Sir:

I would appreciate receiving tear sheets on the article, "Nickel Industry Girds for Peace with New Products," which appeared in the Sept. 6 issue.

A. H. O'NEIL,
Assistant to Vice President
Freeport Sulphur Co.,
122 E. 42 St., New York

● Tear sheets have been mailed.—Ed.

T&W Designed Stampings

Designing products for economy, efficiency and service again becomes a fundamental need in industry. Where deep drawn stampings are required, Transue has the engineering and production knowledge and experience for this kind of designing. For this reason you will find, as in the past, that T & W stampings *usually cost less at the point of assembly.*

DESIGNERS AND MAKERS OF DEEP DRAWN STAMPINGS

This Industrial Week . . .

- **Steel Ingot Rate Still Low at 66.5 Pct**
- **Industry Fears Steel Labor Trouble**
- **Steel Price Rise Seen Overdue**

COAL output at mines near steel centers was picking up rapidly this week, but the disruption in steelmaking schedules caused by the shutdowns was still holding the steel ingot rate at subnormal levels. Steel ingot production this week is estimated at 66.5 pct of rated capacity, up one point from last week's unusually low point.

It will take a few weeks at least to untangle production snarls and to bring back into production all blast furnaces and openhearths which were forced down by the mine shutdowns. Steel ingot loss this week will be around 300,000 tons when compared with output four weeks ago.

Rumors persist in the steel industry, without confirmation, that a steel walkout either on an industry-wide basis or on a company-by-company basis is in the making. Such reports may be premature or even without foundation if judged by the comparatively conservative past actions of the CIO-United Steel Workers of America. However, if the age-old method of compromise has been junked by the steel union and it follows the lead of other CIO organizations that the wage raise will be 30 pct and nothing less, then the steel industry may well face a labor disruption which will again cut down production and hold up reconversion. Steel companies insist that any wage increase granted whether it be a 30 pct adjustment or less must be compensated for by an increase in prices over and above adjustments which are expected soon.

THE Office of Price Administration's delay in announcing general steel price adjustments to cover increased steel production costs to date is having serious repercussions on the distribution of many steel products. Some steel concerns are being forced to cut down production of these products on which they are losing money and concentrate as far as possible on the output of items showing a better return. This enforced action fits in with consumer demand which is calling loudly for the more highly finished steel products, the return on which steel companies claim is necessary to keep them out of the red.

It is believed in some steel circles that OPA's hold-up in raising steel prices may be related to possible changes in corporate tax structure now before Congress. It is feared that OPA may shelve price adjustments until the extent to which producers may be benefited by forthcoming tax relief becomes more apparent. However, the 75¢ a ton increase suddenly granted on all grades of pig iron except charcoal may be indicative of a sudden announcement in steel price increases within the next 30 days.

No matter what adjustments are made in the steel price structure the smaller nonintegrated steel companies claim that the relief will be based on the average return for larger steel companies and will leave them in the same squeeze position where they have been since profitable war contracts were canceled. Many of these smaller companies had been granted special prices above the regular steel price ceilings, but because of normal steel market factors such premiums cannot be obtained.

HEAVY steel buying, already far ahead of faltering shipments before the coal strike, continues to widen the gap during the industry's convalescent period. Finishing mill schedules were still somewhat adversely affected this week because of the lower ingot rate. Producers were as yet unable to make definite delivery promises on many products especially flat-rolled in view of the overextended deliveries for products already booked.

It is becoming more apparent that steel consumers are attempting to place as much business as possible on order books so as to mitigate inventory shortages and to offset as far as possible expected price adjustments. However, backlogs are so heavy that higher steel prices will catch most of this unshipped tonnage. Long-range plans of consumers apparently dictate a policy of acquiring as much material as possible before further increases resulting from additional higher labor costs could be achieved.

Steelmakers point out that there is one sharp difference from the drive for inventory purchases today as compared with the 1919 situation. At that time markets for manufactured goods had not been expanded by a long war. Today there is considerably more basis for a buying rush involving quantities which might ordinarily produce top-heavy inventories. Such a move might be justified by anticipated heavy future manufacturing schedules.

Firm delivery commitments are currently almost impossible to obtain on many products, but plates and several alloy steel items are available for early delivery. Structural steel deliveries at specific mills are extended as far as next March. Hot-rolled strip is now quoted for February delivery while heavy gage hot-rolled sheets are being promised for January. Carbon bars in smaller sizes are being promised for March and the feeling persists that once the coal difficulties are completely out of the picture and the wage-price controversy compromised, steel backlogs will be pared down considerably. All delivery promises remain tentative, however, since the effects of the coal shutdowns will be felt for some time in the steel industry.

• **PITTSBURGH PLUS REMINISCENCES** — Because of the steel industry's past and present day expansion of its basing point system, added interest is being shown in a hearing set for Nov. 7 before the Circuit Court of Appeals, Philadelphia. The hearing relates to a motion filed in 1938 by the U. S. Steel Corp. for a review of the FTC order of July 21, 1924, the first of the kind ever issued, calling upon the corporation to cease and desist from the sale of rolled steel products on a Pittsburgh-plus basis. The corporation complied with the order but in its petition it requested review of the order because of changed conditions in the industry through the development of the multiple basing point system. This system now is being further expanded. Last May the Philadelphia Court denied an FTC motion to strike out that portion of the corporation's petition which referred to changing conditions in the basing point pricing system. FTC continues to hold out for its traditional demand for an f.o.b. pricing system.

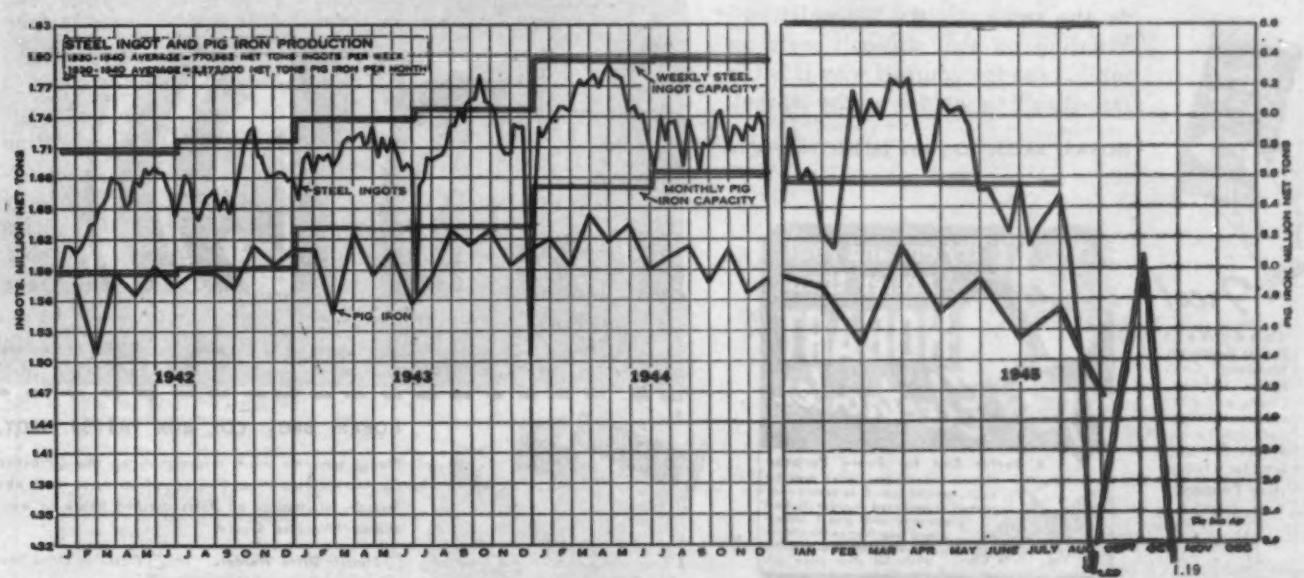
• **SURPLUS STEEL PLANT DISPOSAL**—Hearings on the Surplus Property Administration's report on surplus steel plant disposal policies will open before a Joint Senate Committee made up of members of the Senate Small Business Committee, Surplus Property Subcommittee of the Senate Military Affairs Committee and the Senate Special Committee on Postwar Policy on Nov. 5. Although no list of witnesses has as yet been compiled, the Committee will formally notify the steel industry that those companies desiring to present testimony will be permitted to do so. A number of railroad companies are expected to be invited, together with the governors of several states.

• **ALLOY STEEL**—Jones & Laughlin Steel Corp., recently marketed two new alloy steels, a departure from their normal business which has heretofore been purely carbon steel grades. "Otiscoloy," a high tensile steel, is stated to be comparable to cor-ten, yolloy, nax and other such steels, and is a manganese-phosphorus-copper alloy. "Jalloy" is a takeoff from the armor plate made by J&L during the war and is a high tensile, heat treatable, manganese-molybdenum steel. This is made in three grades, low, medium and high carbon. The low carbon is mainly for flat-rolled products; the medium for shafting, heat treatable plates and forging steels; and the high carbon is for spring steels, shovel steel and other abrasive resistant uses. Also, the company is contemplating marketing a line of cold-finished alloy bars. Hot-rolled alloy bars will be purchased, cold finished and sold as J&L alloy steel. This latter has not yet been completely decided upon, but it is intended as a method of rounding out the company's line of cold-finished products.

• **FREIGHT CAR ORDERS**—Strong interest is reported in high tensile, low alloy steels, particularly from the railroads. Southern Pacific and Union Pacific have placed orders totaling 2100 cars, the bulk of them box cars, using these steels. With the financial arrangements between the Export-Import Bank and the French Buying Commission reported nearing completion, orders for 500 or more locomotives are expected soon. This is in addition to a previous order for 700 locomotives, on which delivery has been started. Gulf, Mobile & Ohio has ordered 24 diesel locomotives, 20 of them for freight, two 2000 hp streamlined passenger locomotives and two road switchers. Orders were placed with Electro-Motive, Baldwin and American Locomotive. Baltimore & Ohio has ordered 8 sleeping cars from Pullman-Standard, scheduled for the third quarter of 1946.

• **NAIL KEGS** — The Navy's need for a nail keg that would stand up under the severity of overseas shipment during wartime led to the development of a steel drum that may eventually replace the traditional wooden nail keg, the American Iron & Steel Institute says. The most appropriate type developed and tested is a cylindrical steel drum, having a welded side seam, the bottom necked in with a double seam and the rolling hoops located as near the top and bottom chines as practicable. Two gages of sheet metal may be used in constructing the drum, 24-gage for export and 26-gage for domestic service. The design is based on a content of about 100 lb. of nails. The size of the container accordingly varies with the length of the nails and the way they pack.

• **COAL SHORTAGE EXPEDIENT** — Faced with a shortage of coke oven gas caused by the recent coal strikes, Ford Motor Co. liquefied propane gas with blast furnace gas and fed it to the open hearths and heat treating furnaces during the shortage. Addition of the propane, whose cost was triple that or ordinary coke oven gas, raised the BTU content of the blast furnace gas to the extent that it could be used in the furnace.



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
October 16.....	47.0	75.0*	50.5*	76.5	73.0	67.0*	72.0	94.0	96.0	99.0	94.0	67.5	85.0	85.5*
October 23.....	51.5	72.0	49.0	77.0	81.0	80.5	70.0	94.0	97.5	52.0	81.0	67.5	85.0	66.5

* Revised

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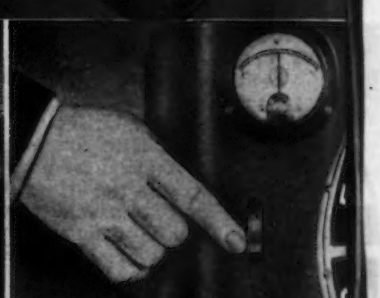

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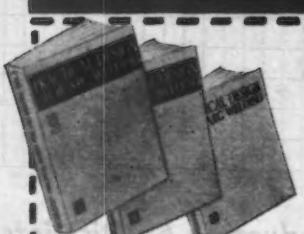

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Youngstown Coal Rate Reductions Branded "Utterly Inadequate"

Pittsburgh

• • • The action last week of the Interstate Commerce Commission reducing freight rates from various coal shipping centers to the Youngstown area has met with rather violent reactions on the part of industrial coal users in that area. The reduction, termed "utterly inadequate" by one top official of the Youngstown Sheet & Tube Co., is being studied closely to see what further action by Youngstown coal users will be taken.

Youngstown industrialists feel that the decision of the ICC is a deliberate attempt on the part of the ICC and the main railroads that serve that area to stifle local railroad transportation and flout the general welfare of that community.

The new rates, which go into effect on Feb. 1, 1946, are: 89¢ per ton from mines in the Leetonia district; $1.32 per ton from Indianola and Russellton, Pa.; $1.37 per ton from mines in

. . . By T. E. LLOYD . . .

o o o

the Pittsburgh district; 80¢ per ton for ex-river coal shipped from Conway and Colona, Pa.; and 80¢ a ton for ex-river coal shipped from Conway and Colona, Pa., to Warren, Ohio.

In spite of the reduction in rates, in several instances trucking rates are still considerably lower, and much of the coal from specific areas will continue to be shipped by truck. For example, about 20 pct to 25 pct of the coal from the Butler area will be shipped by truck and about 80 pct will continue to be shipped by truck from the Leetonia area. The bulk of the latter coal is mainly for domestic consumption. The Leetonia trucking rate is about 60¢ a ton against the new rail rate of 89¢ a ton.

Actually, the new ex-river rate, which is 80¢ a ton reduced from 90¢ a ton, does not equalize this rate with other comparative coal hauls in other districts. From the accompanying table, it can be readily observed that coal hauls by rail to other consuming districts are, per ton-mile, considerably cheaper than from the river points to Youngstown. The cost per ton-mile (revenue per ton-mile, Col. 3 of Table) to the consumer in Youngstown is still from 3 mills to 12 mills higher than any rate shown in the table. Likewise, the revenues to the railroads per car-mile, per 50 car train-mile, per 100 car train-mile, and per car based on the Colona-Conway, Pa., to Youngstown rates, are all proportionately greater.

The history of the rate fight between Youngstown and the ICC is an interesting case in ICC rate studies. It is now possible to move coal barged from the mines to Conway and Colona by rail to Youngstown mainly because

Comparisons of Ex-River Coal Rates of Youngstown Sheet & Tube Co., from Colona and Conway, Pa., to Youngstown, with Rates on the Same Movement, Based on Revenue per Ton-Mile for Similar Traffic.
(Based on Average Carload of 67.8 Net Tons Except on Iron Ore)

	1	2	3	4	5	6	7	8	9	10
	Mileage	Carload Weight, Net Tons	Rate Per Ton, Dollars	Revenue Per Car, Dollars	Revenue Per Ton-Mile, Mills	Revenue Per Car-Mile, Dollars	Revenue Per Train-Mile, 50 Car Train, Dollars	Revenue Per Train-Mile, 100 Car Train, Dollars	Revenue Per Car, Based on Conway-Colona Mileage, Dollars	Resultant* Rate per Net Ton Based on Conway-Colona Mileage, Dollars
Ex-River Coal Rates Based on Feb. 1, 1946, ICC Rates from Conway-Colona, Pa., to Youngstown	42.25	67.8	0.80	54.24	18.93	1.283	64.15	128.30	54.24	0.80
(A) Ex-River Coal of Youngstown Sheet & Tube Co., from Colona-Conway, Pa., to Youngstown	42.25	67.8	0.90	61.02	21.30	1.444	72.20	144.40	61.02	0.90
(A) Ex-Lake Iron Ore of Youngstown Sheet & Tube Co., from Lower Lake Erie Ports to Youngstown	71.4	71.77	0.7857 c 0.88 G. T.	56.39	11.00	0.790	39.50	79.00	33.38	0.47
Lake Cargo Coal from Pittsburgh District to Lower Lake Ports for Trans-Shipment via Vessel	181.0	67.8 d	1.56	105.77	8.57	0.581	29.05	58.10	24.55	0.36
Coal from Jerome Mine, Pa., to Glenwood for Trans-Shipment via Barge	131.4	67.8 d	1.25 b	84.75	9.51	0.645	32.25	64.50	27.25	0.40
Coal from Eureka Colliery No. 30, Pa., to Jacks Run Dock, Pittsburgh, for Trans-Shipment via Barge	109.0	67.8 d	1.25 b	84.75	11.47	0.778	38.90	77.80	32.87	0.48
Ex-River Coal from Cincinnati to Middletown Ohio	44.4	67.8 d	0.70	47.46	15.77	1.069	53.45	106.90	45.17	0.67
Coal from Logan District, W. Va., to Huntington, W. Va., for Trans-Shipment via Barge	87.8	67.8 d	0.55 c	37.29	6.57	0.446	22.30	44.60	18.84	0.28

*—Resultant rates shown in Col. 10 are what the ex-river rate to Youngstown would be if it were established on the same ton-mile earning basis as the various rates shown. Col. 10 is Col. 5 x 42.25, the ex-river mileage haul.

A—Earnings of Youngstown Sheet & Tube Co., ex-river coal and iron ore are actual figures taken from company files, except on the basis.

b—Rate applies f.o.b. barge and includes dumping charge.

c—Rates are not subject to Ex Parte 148 increase of 3¢ a ton.

d—Weight shown is average carload weight of Youngstown Sheet & Tube Co., ex-river coal from Colona and Conway, Pa. Actual average carload weights of bituminous coal originated on the lines hauling from these points were: B & O RR—55.1 net tons; C & O RR—58.4 net tons; Pennsylvania RR—56.0 net tons.

of the efforts of a railroad that now carries none of this coal. The Pittsburgh, Lisbon & Western Railroad in 1927 applied to the ICC for permission to build branch lines from the Ohio River to Youngstown, thus constituting a through line that connected with the Youngstown Sheet & Tube Co. tracks and with the Youngstown terminal tracks of the Erie Railroad. A 60¢ per ton rate was proposed by PL&W for this haul. Because Pittsburgh & Lake Erie and Pennsylvania Railroads, which had through lines, expressed willingness to construct river terminals to name an ex-river rate on coal, ICC denied the PL&W application. The terminals were built by PRR and P&LE and a rate of $1.02 per ton was proposed, but ICC sustained the offer, prescribing 77¢ per ton, effective July 16, 1932. This 77¢ rate was subject to a 6¢ per ton emergency charge until Oct. 1, 1933.

At that time the emergency charge was dropped, but from Oct. 1, 1933 to June 19, 1934, a 12¢ per ton lifting charge was in effect, over and above the 77¢ per ton hauling charge. On June 19, 1934, in spite of the fact that an application for a 90¢ per ton rate (with a 12¢ per ton lifting charge) was enjoined by court action, the minimum rate of 90¢ per ton was put into effect. On Apr. 18, 1935, the rate was increased to $1.00 per ton by the addition of a 10¢ per ton emergency charge. In November 1935, the 10¢ emergency charge was eliminated and the 12¢ lifting charge was reduced as a result of the threatened motor truck competition. On Nov. 15, 1937, an additional 0.5¢ per ton was added to the lifting charge. On Mar. 18, 1942, because of Ex Parte 148 increases, the rate became 93¢ per ton and the lifting charge became 6c per ton. These increases were removed May 15, 1943, and the rate became 90¢ per ton with a 5.5¢ per ton lifting charge. These rates were effective until the changes in rates made by the ICC during the past week.

As to the Pittsburgh rate, the reduction in all rail coal movement from Pittsburgh to Youngstown was only 7¢ a ton, an insignificant amount according to a representative of the Western Pennsylvania Coal Operators Assn., and spokesmen for Youngstown industrial interests. Actually, about 2,000,000 tons of coal a year move by rail from Pittsburgh to Youngstown, a quarter of which is used for industrial purposes. Another peculiarity of the new rate adjustment is the rate for ex-river coal from Conway and Colona, Pa., to Warren, Ohio. This rate has been $1.00 per ton, but has been reduced to 80¢ per ton, equal to the rate into Youngstown despite the fact that the haul to Warren is some miles further along the same railroad lines.

The Russellton and Indianola rate change affects only one consumer, Republic Steel Corp., which owns and operates these coal workings.

The new rate adjustment by the ICC culminates a fight between the Youngstown interests and the ICC that has lasted more than a decade. Consequently, there is considerable disappointment at what are termed the "insignificant and utterly inadequate reductions." Further ICC hearings may be asked at the present time, but not too much is expected to be gained by such a procedure. Another possibility is waiting a few years and then asking for a reconsideration by the ICC. This is favored in some quarters. The third possibility is to take the matter to the Supreme Court, but the fact that the Court probably would not review the case on the basis of the facts presented but only on the basis of the conclusions arrived at by ICC makes this move purely an academic possibility.

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Washington

• • • **To become effective** on or before Feb. 1, 1946, the Interstate Commerce Commission through Commissioner Aitchison has ordered reductions ranging from 5¢ to 12¢ per net ton in rates on coal to the Youngstown district from the Pittsburgh and Leetonia districts and Indianola and Russellton in the Freeport district in Pennsylvania.

The reduced and present all-rail rates are:

From	*Present Rate*	*Reduced Rate*
Pittsburgh District ..	$1.44	$1.37
Indianola and Russellton (in Freeport District)	$1.44	$1.32
Leetonia District ...	94¢	89¢

The ex-river rate from Conway and Colona, Pa., was reduced 10¢ from 90¢ to 80¢.

The Commission's conclusions are substantially the same as those recommended by Examiner Hosmer (THE IRON AGE, Jan. 11, p. 88). Steel producers in the Youngstown district had attacked the rates as unreasonable.

Investigation of the rates was instituted by the Commission upon request of the late President Roosevelt for a report on the proposed Lake Erie-Ohio Canal. The report commented on findings of Army engineers that the project could not be justified if the rail carriers reduced rates by an average of 29¢ per ton. The Commission's report on the Army engineers' findings declared that the railroads would suffer substantial revenue losses in the affected territory if such reductions were made. The majority report ordering reduced rates said that the record contains no evidence with respect to any effect which the rates under investigation might have on the proposal to construct a canal.

Dissenting were Commissioners Porter and Patterson who said the cuts did not go far enough. Commissioner Porter declared that a 15¢ or even a 12¢ reduction in the Pittsburgh district rate and a 10¢ reduction in the ex-river rate (the latter was ordered) would probably forestall construction of the canal. He proposed a 12¢ reduction in the Pittsburgh district rate and extension of the 12¢ cut in the Indianola-Russellton rate to the entire Freeport district.

Orders 2000 Hp Diesels

Philadelphia

• • • **The Baldwin** Locomotive Works has received an order from the Central Railroad Co. of New Jersey for three 2000 hp diesel-electric passenger locomotives.

This purchase by the Jersey Central represents a major step in a broad program designed to improve the railroad's suburban passenger service out of Jersey City by replacing some steam power with the most modern diesel-electric locomotives capable of operating at speeds up to 90 mph.

The new locomotives will be of the double-end type, with an operators cab at both ends to permit operation in either direction without the need for a turntable at terminals. Each locomotive is to be powered by two Baldwin 1000 hp diesel engines of the latest design. Generators, motors and electrical control equipment will be supplied by Westinghouse Electric Corp.

Each of the new locomotives will be equipped with a steam boiler for train heating, generator equipment for lighting the entire train and automatic train control.

Budd Output Will Take 18,000 Tons Of Stainless a Year

. . . By S. H. BARMASEL . . .

Philadelphia

• • • When up to full production schedules, which is expected to be reached by the summer of 1946, the Edward G. Budd Mfg. Co. will consume approximately 36,000,000 lb of stainless steel a year in its Philadelphia plants alone. Of this total, 1,870,000 lb of stainless steel strip and 330,000 lb of stainless steel sheet a month will be used for railroad cars. Stainless steel consumption for trailer bodies will reach 800,000 lb a month.

Railway passenger cars and trailer bodies are being produced at the company's new plant in Philadelphia. Tooling for this plant started in June of this year. The main assembly and manufacturing building covers 24½ acres and provides six main bays, each 1800 ft long. This plant, when completely reconverted and equipped, will produce two to four stainless railroad passenger cars a day.

Production of automobile bodies will continue at Budd's Hunting Park plant on an expanded scale. This increased output, approximately three times the prewar average, necessitated expenditure of $6 million for new presses, welding equipment, conveyors and new plants. Here will be made Ford commercial bodies, fenders, hoods and passenger bodies; Chevrolet truck frames, passenger frames, truck doors and fenders; Nash fenders; Chrysler roofs; International Harvester doors, and Studebaker commercial and passenger bodies. Sheet consumption at this plant will be approximately 500,000 tons by next summer. Before the war 500,000 tons of sheet were consumed in automobile body manufacture.

At present there are three main deterrents to full production. These are new machinery, materials and skilled manpower. Delivery promises offered Budd on stainless steel products are far from sufficient at present, but the company anticipates even further difficulty in view of labor demands in the steel mills. If the much-discussed forthcoming steel strike materializes, the company expects to be forced to shut down its plants since material can hardly be accumulated under present conditions.

London Trade Exhibition

London

• • • Swinging into postwar activities the Gauge & Tool Makers' Assn., composed of firms engaged in the manufacture of gages and measuring instruments; jigs, fixtures and special tools; press tools; moulds and dies; and diamond tools and gages, is holding a trade exhibition in the New Hall, Vincent Sq., London, S.W.1., England, from Jan. 7-19. Overseas visitors and buyers have been invited to the exhibition.

AMERICAN IRON AND STEEL INSTITUTE
CAPACITY, PRODUCTION AND SHIPMENTS

Period AUGUST - 1945

Steel Products	Number of companies	Items	Maximum Annual Potential Capacity Net Tons	Current Month: Production Net Tons	Current Month: Production Per cent of capacity	Current Month: Shipments (Net Tons) Total	Current Month: Shipments (Net Tons) To members of the industry for conversion into further finished products	To Date This Year: Production Net Tons	To Date This Year: Production Per cent of capacity	To Date This Year: Shipments (Net Tons) Total	To Date This Year: Shipments (Net Tons) To members of the industry for conversion into further finished products
Ingots, blooms, billets, tube rounds, sheet and tin bars, etc.	51	1	xxxx	xxxx	xxx	405,001	149,582	xxxx	xxx	5,575,112	1,515,646
Structural shapes (heavy)	11	2	9,580,550	300,377	38.7	286,333	xxxx	2,295,404	38.4	2,298,595	xxxx
Steel piling	4	3		14,780		13,187	xxxx	154,354		157,262	xxxx
Plates (sheared and universal)	27	4	17,841,320	484,683	32.0	470,575	33,087	5,511,140	46.4	5,390,567	407,396
Skelp	6	5	xxxx	xxxx	xxx	64,146	28,506	xxxx	xxx	515,470	272,295
Rails—Standard (over 60 lbs.)	4	6	3,669,000	191,840	61.5	176,093	xxxx	1,478,229	60.5	1,447,475	xxxx
—All other	5	7	512,000	12,007	27.6	10,013	xxxx	111,879	32.8	114,709	xxxx
Splice bars and tie plates	12	8	1,745,960	57,704	38.9	60,030	xxxx	505,281	43.5	522,511	xxxx
Track spikes	10	9	349,400	12,366	41.7	13,025	xxxx	102,851	43.9	106,299	xxxx
Hot Rolled Bars—Carbon	38	10	xxxx	575,382	xxx	466,094	67,700	5,766,173	xxx	4,538,110	713,677
—Reinforcing—New billet	13	11	xxxx	65,799	xxx	69,117	xxxx	433,108	xxx	440,398	xxxx
—Rerolled	14	12	xxxx	3,986	xxx	5,950	xxxx	48,306	xxx	55,293	xxxx
—Alloy	24	13	xxxx	153,841	xxx	111,733	12,086	1,968,437	xxx	1,425,498	172,249
—Total	46	14	22,381,700	799,008	42.0	652,894	79,786	8,216,024	55.1	6,459,299	885,926
Cold Finished Bars—Carbon	25	15	xxxx	118,544	xxx	115,154	xxxx	1,188,439	xxx	1,184,341	xxxx
—Alloy	25	16	xxxx	25,730	xxx	21,537	xxxx	283,489	xxx	256,119	xxxx
—Total	32	17	3,015,910	144,274	56.3	136,691	xxxx	1,471,928	73.5	1,440,460	xxxx
Tool steel bars	17	18	273,010	9,751	42.0	8,436	xxxx	90,301	49.7	89,420	xxxx
Pipe and Tubes—Butt weld	16	19	2,232,520	127,744	67.3	128,703	xxxx	1,031,847	69.4	1,010,625	xxxx
—Lap weld	9	20	850,200	38,642	54.8	39,090	xxxx	357,357	64.6	369,301	xxxx
—Electric weld	11	21	1,570,900	78,518	58.8	72,177	xxxx	693,451	66.3	617,201	xxxx
—Seamless	16	22	3,377,700	190,270	66.3	142,769	xxxx	2,018,417	89.7	1,597,695	xxxx
—Conduit (cap. & prod. incl. above)	7	23	xxxx	xxxx	xxx	8,088	xxxx	xxxx	xxx	56,949	xxxx
—Mech. tubing (cap. & prod. incl. above)	11	24	xxxx	xxxx	xxx	44,780	xxxx	xxxx	xxx	501,917	xxxx
Wire rods	27	25	7,266,670	345,709	56.0	107,710	35,372	3,024,284	62.5	879,927	304,868
Wire—Drawn	41	26	5,664,690	258,574	53.7	149,536	9,628	2,367,019	62.8	1,414,181	79,991
—Nails and staples	19	27	1,253,360	48,441	45.5	47,858	xxxx	397,001	47.6	401,826	xxxx
—Barbed and twisted	15	28	539,610	18,188	39.7	18,213	xxxx	157,084	43.7	157,346	xxxx
—Woven wire fence	16	29	1,113,860	28,402	30.0	28,786	xxxx	240,839	32.5	239,686	xxxx
—Bale ties	12	30	149,700	6,090	47.9	7,138	xxxx	49,347	49.5	55,224	xxxx
Black Plate—Ordinary	9	31	xxxx	xxxx	xxx	41,757	385	xxxx	xxx	337,728	3,319
—Chemically treated	8	32	465,000	7,882	20.0	7,485	xxxx	75,771	24.5	69,536	xxxx
Tin and Terne Plate—Hot dipped	10	33	3,793,850	168,200	52.2	176,882	xxxx	1,384,978	54.8	1,478,352	xxxx
—Electrolytic	10	34	2,231,850	72,849	38.4	68,411	xxxx	587,660	39.5	601,818	xxxx
Sheets—Hot rolled	30	35	19,197,320	1,072,952	65.8	519,829	30,974	9,010,338	70.5	4,562,434	311,624
—Cold rolled	12	36	7,131,460	368,388	60.8	216,982	xxxx	3,004,751	63.3	1,740,822	xxxx
—Galvanized	16	37	2,915,130	134,523	54.5	135,633	xxxx	1,161,454	59.8	1,166,207	xxxx
Strip—Hot rolled	24	38	7,055,390	190,669	31.8	122,078	21,741	1,792,506	38.2	1,112,034	184,923
—Cold rolled	35	39	3,119,850	99,983	37.7	94,490	xxxx	929,455	44.7	874,465	xxxx
Wheels (car, rolled steel)	5	40	319,400	21,609	79.6	23,255	xxxx	196,465	92.4	196,742	xxxx
Axles	6	41	408,170	11,196	32.3	11,327	xxxx	98,474	36.2	101,082	xxxx
All other	5	42	190,490	3,644	22.5	3,238	xxxx	32,079	25.3	29,464	xxxx
TOTAL STEEL PRODUCTS	152	43	xxxx	xxxx	xxx	4,512,637	389,059	xxxx	xxx	43,689,537	5,962,988
Effective steel finishing capacity	152	44	67,310,000	xxxx	xxx	xxxx	xxxx	xxxx	xxx	xxxx	xxxx
Percent of shipments to effective finishing capacity	152	45	xxxx	xxxx	xxx	72.1%	xxxx	xxxx	xxx	88.6%	xxxx

During 1944 the companies included above represented 99.0% of the total output of finished rolled steel products as reported to American Iron and Steel Institute.

Canada Will Continue To Import Certain Steel Specialties from U. S.

Toronto

• • • **While Canada** has become largely independent of the United States with regard to steel supply as a result of big expansion of her steel making facilities and the introduction of many new steel lines during the war period, imports, from across the line, in specialties will continue, but on a greatly reduced scale. Also there are various steel materials that are not yet produced in this country and at the moment there is no indication that Canadian companies plan additional lines.

As an example of production that is not undertaken in Canada is bessemer steel. While Algoma Steel Corp. has an old bessemer furnace at its works at Sault Ste. Marie, it is not in operation and has been closed for years. Thus bessemer steel will be retained on the import list. Skelp for the manufacture of pipe also will continue to be imported as there is no production here, and while big tonnages of skelp were imported from Europe before the war, this source of supply now is cut off and it is likely that Canadian consumers will buy largely in the United States market.

Steel materials of special analysis also will remain on the imported list, largely due to the fact that Canadian producers are not contemplating entering into this field owing to the somewhat restricted market and the fact that the cost involved would not make such operation profitable. Dimensional factors also enter in sheets and plate.

With Canadian rolling facilities decidedly limited when compared with those in the States, the larger sizes of sheets and plate will remain on the import list, while the more general lines will be supplied from domestic sources. The Steel Co. of Canada Ltd., Hamilton, will rank among the leading producers of sheets when its new unit goes into operation next month and will be in a position to provide many sizes that formerly were not produced in Canada.

United States steelmakers may have an idea that they may be able to maintain their hold on the Canadian markets by making steel available at prices below those prevailing in Canada. At the present time United States steel prices delivered to Canadian consumers are higher than the Canadian rate.

Previous to the war Canadian prices were based on United States steel prices, with duty, freight and exchange added, thus quotations from Canadian makers were virtually the same as those from the U. S. United States prices have advanced in recent months and there is a possibility that they may go still higher.

So far Canadian prices are ruled by government ceiling and there is no indication that there will be an early change in this condition. Under these conditions it is not likely that the price situation will have any real bearing on imports. On the other hand Canadian steelmakers expect to develop considerable business in the world export markets, and if prices alone were a factor they would be unable to compete with the United States and Britain. However, no difficulty in this direction is expected.

Steel Distribution Trends Seen Changed

New York

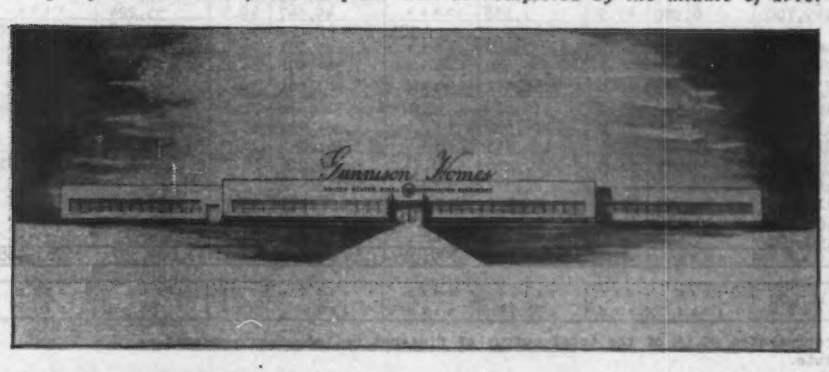
• • • **Steel distribution** figures for the first six months of this year indicate that slightly greater percentages of total shipments went to the container industry, to jobbers, dealers and distributors, and to pressing, forming and stamping firms, compared with their relative positions during 1944, the American Iron & Steel Institute has reported. The dominant position of shipbuilding as a steel consumer has disappeared.

Meanwhile, statistics have been compiled showing where all the finished steel went from January 1942 to July 1945. In that 3½-yr period during the war, more than 28 pct of the nation's finished steel went to makers of ships, airplanes, combat tanks, ordnance and projectiles. Those classifications received 60,335,000 tons out of total shipments of 210,058,000 tons from the start of 1942 to the middle of the current year. At the same time, millions of additional tons went into the war effort through other manufacturing channels.

Jobbers, dealers and distributors ranked second during the 3½-yr period, receiving 25,365,000 tons; exports came next with 20,150,000 tons; followed by contruction which consumed 19,917,000 tons. The steel converting and processing industries such as wire drawing shops, forging shops and so on, took 18,203,000 tons. Railroads received 16,750,000 tons; containers got 13,184,000 tons; pressing, forming and stamping received 9,767,000 tons; machinery and tools received 8,802,000 tons; the automobile industry received 5,539,000 tons; oil, gas, water and mining received 4,913,000 tons; agricultural implements received 2,847,000 tons.

The statistics clearly indicate the sharp percentage declines suffered by such steel-consuming industries as the automotive, construction, railroad, steel container, and the oil, gas, water and mining fields, in comparison with their prewar rank. From now on, with the nation returning to peacetime operations, these industries will get larger shares of the total steel distributed.

PREFABRICATED HOMES: ***Gunnison Homes, Inc., United States Steel Corp. subsidiary, has announced plans for a million dollar plant at New Albany, Ind., for production of prefabricated homes on a production line basis. The plant could produce 1650 houses per year operating on one shift or 3200 units per year on two shifts. The plant will be completed by the middle of 1946.***



War Plant Disposal

Birmingham

• • • **Lewis Jeffers,** wartime executive of Bechtel-McCone Corp., has been named special Reconstruction Finance Corp. representative here and authorized to lease sections of the Birmingham airplane modification plant.

Fairless Says Ceilings and Wage Stabilization Prevent $2 Day Increase

. . . By T. E. LLOYD . . .

Pittsburgh

• • • At a meeting between the CIO steel workers and the U. S. Steel Corp., on Tuesday, the Corporation refused the union's demands for a $2 a day wage increase. No compromise was offered except the possibility of further negotiation after the President's wage-price policy is announced.

In a two and one-half page formal release distributed by the union at the conclusion of the meeting, it was stated that "We regret to report that the U. S. Steel Corp., and other large steel firms do not seem prepared to assume their rightful responsibilities to the nation in the current economic crisis facing the American people."

A letter from Benjamin F. Fairless, president of U. S. Steel Corp., to Philip Murray, president of the CIO, delivered by John A. Stephens, vice-president of U. S. Steel, stated that "existing ceiling prices for steel products, together with the government's wage stabilization policy do not enable U. S. Steel to grant a wage increase at this time.

"Under present OPA ceiling prices," Mr. Murray was informed, "the huge increases in labor and other costs since 1940 have brought us to a point where we are today selling a great majority of our steel products at less than cost."

Philip Murray stated, "at the conference this morning, Stephens read a letter to Murray which purported to be an answer to the CIO demand. Stephens' letter is replete with distortions and absurdities. We expect to reply formally to the U. S. Steel Corp. refuting the contentions of the letter. I sincerely regret the circumstances which resulted in disagreement today. The Corporation contented itself with the preparation of a letter, and were evidently hell-bent on disagreement.

"We will have a meeting of the CIO National Policy Committee," Mr. Murray said, on Friday, Oct. 26. Members will submit a report and action will undoubtedly be taken by the committee. It is our sincere desire that no precipitate action be taken by members of the union that might lead to industrial disturbances. A clear enunciation of national policy for the members of our union will be made through the policy committee meeting," Mr. Murray said.

Terming the new wage demand as "staggering," U. S. Steel said that if granted, the increase would amount to an increase of 22.1 pct in average weekly straight time wages, with a 16 2/3 pct reduction in productive hours per week with a consequent reduction in weekly steel output per worker. The letter to Mr. Murray pointed out that the $2 a day demand would not only apply to the five U. S. Steel Corp. steel producing subsidiaries, but also to other subsidiaries which have contracts with the union. This would increase direct labor costs of all subsidiaries to the extent of $128 million a year, which is equivalent to $6 a ton of finished steel when the Corporation is operating at full capacity.

The letter challenged the fairness of the union's contention that the years 1935 to 1939 be used as a normal base period by which to judge the adequacy or reasonableness of U. S. Steel profits. Present wage rates, the average straight time pay for a steel worker in the five subsidiaries of the Corporation is $1.131 per hr, excluding overtime premiums. The union contends this amount is $1.12 per hr and that the lower figure is declining steadily.

In Mr. Murray's prepared answer to the Corporation's letter he said, "There is no dispute over the immediate need for a wage and salary increase. All the shooting is over the basic question: How much? adequate pay means full employment. Inadequate pay envelopes will certainly force large numbers of willing workers on the unemployment rosters. The issue is clear. If the steel companies milk the economy of more than a half-a-million dollars in 1946 in take-home profits, there will not be enough purchasing power to keep the wheels of industry going."

Further Mr. Murray stated, "This is not only a question of providing large enough pay envelopes to keep the individual worker's kitchen going. The $2 a day demand also involves the question of providing a large enough national pay envelope to keep the economy going and to assure returning veterans and discharged war workers that they will have jobs."

Murray charged that about 1,000,000 steel workers, of which some 800,000 are CIO members, are suffering 25 pct cuts in take-home pay due to the elimination of overtime and pay cuts running as high as 50 pct have resulted from downgrading and other factors. He expressed the belief that cost increases that have come to the steel industry since 1941 are more than offset in 1946 by increased productivity and the substitution of modern, low-cost, government-financed facilities for old, obsolete, marginal plants.

Hook Represents Industry

New York

• • • Charles R. Hook, president American Rolling Mill Co., has been appointed as principal representative of the steel industry at the labor-management conference which opens in Washington, Nov. 5. John A. Stephens, vice-president in charge of industrial relations, U. S. Steel Corp., has been appointed as alternate.

The conference will be presided over by Judge Walter P. Stacy of Wilmington, N. C., who is a member of the National Railway Labor Panel and also has been an associate member of the War Labor Board.

Widmer Resigns From OPA Steel Products

Washington

• • • F. Russell Widmer, chief of the Steel Mill Products Section, OPA, has resigned effective Nov. 1. Mr. Widmer, who has been with the pricing agency since October 1941, will return to the Republic Steel Corp., Cleveland, as assistant manager of the Commercial Research Div.

The Steel Mill Products Section will be consolidated with the Nonferrous Section on Nov. 1. The consolidated sections will be headed by William Sterling, now chief of the Nonferrous Section.

High Farm Income Creates 1 Yr to 2 Yr Sustained Demand

Chicago

. . . By CHARLES T. POST . . .

• • • **Farm equipment** manufacturers are hastening to capitalize on both their strong financial position achieved during the war and by adaptation of wartime mechanical developments to farm machines.

Most manufacturers chalked up banner farm equipment sales records during the war in addition to handling direct war contracts. Despite the vast amount of farm equipment manufactured as essential to the civilian economy, high farm income has created an unsatisfied demand which, it is estimated, will require from one to two years to satisfy. This means an assured volume on which manufacturers may count in laying out postwar production and development plans.

From a design and manufacturing standpoint, the industry farthest removed from the soil, aviation, is casting a strong shadow on new and experimental equipment. In the late thirties, tractor manufacturers began to dabble in hydraulic devices for lifting tools directly mounted on the tractor to allow road travel or the

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crossing of such field obstructions as irrigation checks.

International Harvester Co.'s showing of experimental and pre-production farm machinery last week gave the tip-off as to the extent to which additional hydraulic controls will be adopted heart and soul by the farm equipment makers. In the past, manual levers, screw adjustments, and balance springs have been the conventional means of adjusting such variables as depth of penetration in tillage implements, angling of disc harrows, and rake angles.

International is inaugurating a control system which involves single or double hydraulic control units when used with implements mounted on a frame attached to the tractor. When used with trailing implements as many as four hydraulic units are used, two on the tractor and two on the implement, working in conjunction.

The system allows forcing implements into the ground and holding them there at regulated depths irrespective of soil conditions, as well as lifting of implements provided by prewar hydraulic systems. It also allows selective adjustment, angling, and raising or lowering of individual tillage gangs.

Used in conjunction with harvester-threshers, it makes possible effortless raising and lowering of platforms, formerly achieved mechanically or, on some companies' models, by electric motors. All these adjustments can be made without stopping the tractor.

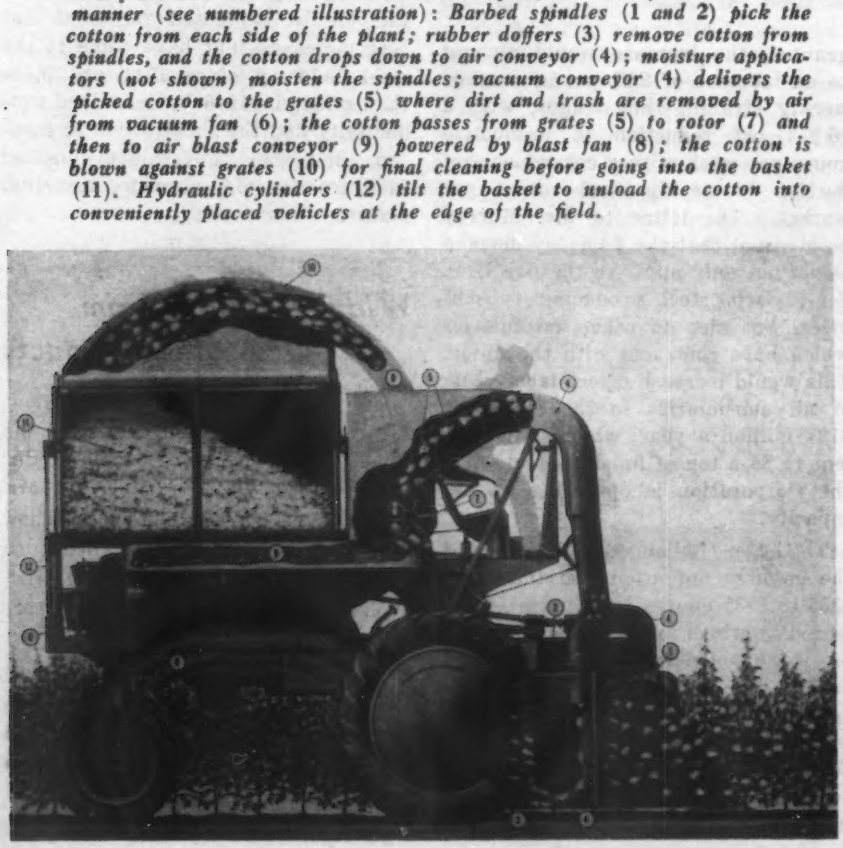
Other farm machinery producers are not far behind International in adapting hydraulic equipment to these and other uses, and further announcements may be expected. Paradoxically, the farm equipment industry, centered in the Midwest, is going as far as the West Coast for design and procurement of these hydraulic units in the belief that suppliers formerly serving the aircraft industry can most efficiently and economically fulfill their needs.

Not so many years ago a blacksmith shop product, the modern farm tractor is finally becoming a precision machine embodying such developments as shaved gears. Where sheer weight formerly was considered an asset in holding the tractor to the ground, improved design and better traction afforded by rubber tires is allowing operating economies through elimination of dead weight. Still containing a proportionately larger weight of castings than other types of power equipment, new models indicate increasing use of welded structures, both for frames and in welded sheet metal housings.

The industry as a whole has not quite made up its mind as to how small a tractor can be built to woo the vast small farm market. Nearly 60 pct of the nation's farms are said to contain 40 acres or less, and, with decentralization of the industry, the number of part-time farmers is expected to grow.

Dominant in the North Atlantic, Midwest, and Far West, the tractor sees its biggest virgin market in the horse and mule sections of the South and Southwest. Obviously, the tractor to serve the small farm market must

COTTON PICKER: *First mechanical cotton picker to go into volume production will be one by International Harvester Co., to be manufactured at a plant now under construction at Memphis, Tenn. It functions in this manner (see numbered illustration): Barbed spindles (1 and 2) pick the cotton from each side of the plant; rubber doffers (3) remove cotton from spindles, and the cotton drops down to air conveyor (4); moisture applicators (not shown) moisten the spindles; vacuum conveyor (4) delivers the picked cotton to the grates (5) where dirt and trash are removed by air from vacuum fan (6); the cotton passes from grates (5) to rotor (7) and then to air blast conveyor (9) powered by blast fan (8); the cotton is blown against grates (10) for final cleaning before going into the basket (11). Hydraulic cylinders (12) tilt the basket to unload the cotton into conveniently placed vehicles at the edge of the field.*



be low in price, but it also must be big enough to handle such heavy work as plowing.

Shortly before the war the Ford-Ferguson met the challenge with a tractor lower priced and lighter than the leading models of old-line manufacturers. It relied on design advantages to provide plowing efficiency comparable to that of larger competing models. Although it made substantial sales inroads, its field was limited by lack of a broad line of associated tools for specialized operations, and by the fact that existing tools did not provide as great efficiency as the specially designed plow. The Ferguson company has been working hard to correct these deficiencies in order to blanket the field as completely as its competitors.

The Ford was in no sense of the word a baby tractor in size or selling price in comparison with the smallest Allis-Chalmers, Deere, and International models. These smaller models had been, and still are, considered by many to be the tiniest which could efficiently power a small farming operation.

As in the automobile field, the small tractor runs into competition from larger machines in the used market. Last week, International announced the Farmall Cub still in the pre-production stage, weighing only 1050 lb and, it is hoped, to sell for around $400. This is the smallest tractor to be announced by the larger manufacturers. Some of the other baby tractors have lacked a full line of associated implements, but International will build a full line for this new machine, proportionately priced so that the Cub and all necessary implements for a small farm will sell for under $1,000.

John Deere, which for some time has been field testing experimental models of comparable size, is said still notto be completely convinced that such a small tractor can handle the necessary work. Ford, also, has been studying the possibilities of a smaller model.

As the larger tractor manufacturers are examining the possibility of building smaller machines, the so-called garden or walking-tractor manufacturers are thinking of building bigger models on which the operator rides. Food Machinery Corp. of San Jose, Calif., one of whose predecessor companies made a walking tractor for a short time after the last war, has a small three-wheel machine. Seaman Motors, Milwaukee, whose activities have principally been in soil stabilization equipment, will attempt to break into the agricultural field with a tiller unit to be drawn behind a conventional tractor. The Rototiller, an established garden tractor now under the aegis of Kaiser-Fraser, conceivably could be up-designed into the small tractor field.

SMALLEST YET: *International Harvester Co. will build a large new plant at Wood River, Ill., to produce the Farmall Cub tractor, smallest yet to be announced by a major farm equipment manufacturer, and other small tractors and integrated implements. The Cub, which weighs 1050 lbs., will sell for about $400, or, with a complete set of implements, for around $1,000.*

One fact is increasingly clear. No manufacturer can hope to go far in the tractor field unless he has a broad and varied line of implements for all type of crops and field conditions. International Harvester, the largest manufacturer in the field, last week displayed 32 production and 3 experimental tractors and 49 production and 65 experimental machines other than tractors, not including combinations.

The rash of tractor manufacturers before and just after the last war reflected the belief that the tractor was merely a power unit to pull implements formerly drawn by horses. Increasingly in the last decade, and now inevitably, more and more implements are either mounted on the tractor as an integral unit or specially designed and engineered for a particular use with a particular tractor. With hydraulic control units, the relationship becomes still closer. The necessity of producing such a large variety of equipment in order to sell the tractor has driven away automobile and other types of manufacturers whose business has been founded upon one or two basic units.

New developments are imminent in the perennial battle for favor between the crawler type and the wheel type tractor. Wheel tractors, which are standard in the Midwest farm market, never have made satisfactory headway in dislodging the crawler from the vast ranch acreages, rolling hills, and special soil conditions found in the Far West because of the operating economies of large diesel engines and superior traction afforded by the crawlers.

Caterpillar Tractor Co. founded its success upon these agricultural installations, with Cletrac (now part of the Oliver Corp.), International, and Allis-Chalmers making a bid for this business.

Development of mammoth wide base pneumatic tires dislodged the slower crawlers from their stranglehold on the earth-moving industry in the years immediately preceding the war, and now much larger wheel tractors, many of them diesel-powered, may be expected to make a bid for the business of ranches on which special soil or topographic conditions do not make crawlers absolutely essential. The rapidly expanding Massey-Harris Co. will announce a line of heavier wheel tractors next year.

But the battle is not one-sided. Oliver has in the pre-production stage a small agricultural type Cletrac equipped with rubber tracks to meet the challenge of speed and to enable operation upon the highways, hereto-

fore forbidden ground to the steel-cleated crawlers. Oliver even sees a possibility of invading wheel tractor territory with this model. Nor are the crawlers abandoning the industrial field. International has an engineering model diesel crawler, known as the TD-24, considerably larger than any of its previous models, and even larger than the largest Caterpillar which, along with the largest Allis-Chalmers, have been the biggest made to date. Allis-Chalmers also is understood to be contemplating a move in the same direction.

Wright Plant Holds Auction

Buffalo

• • • **Public auction** of equipment at the Curtiss-Wright Corp.'s Kenmore plant Nov. 7 to 10, consisting of more than 4000 separate items which cost nearly $3,400,000, is expected to draw hundreds of machinery buyers from all parts of the U. S.

The move was made by Curtiss to clear the plant as rapidly as possible and to give manufacturers an opportunity to buy tools and machinery essential to reconverting industry.

Among the "hard-to-get" items listed for sale are stamping and forging presses, machine tools and precision testing instruments.

Labor and Material Troubles Holding Up Farm Implement Boom

Chicago

• • • **Heavy capital outlays** are planned by the farm equipment industry to expand manufacturing facilities, but current production is walking a tightrope stretching from labor difficulties in its own and suppliers' plants to shortages of materials.

Although most principal producers have foundry facilities in their own plants to supply a portion of their requirements, heavier production schedules have sent them into the tight open market for gray iron and malleable castings. One farm equipment firm, which has gray iron foundries at three of its plants, also is buying from 82 outside foundries..

So far, the industry generally has been on the winning side of a nip and tuck battle to maintain current production schedules, but even where manpower is adequate in its own plants, shortage of labor in the commercial foundries prevents rapidly expanding these schedules. Even International Harvester Co., whose total foundry capacity is substantial, is hit by the outside malleable bottleneck. Massey-Harris has just completed a model gray iron foundry at its Brantford, Ont., plant, and fortunately has malleable facilities at its Batavia, N. Y., plant.

The industry is particularly vulnerable to labor disturbances among its suppliers because of the high percentage of components which must be procured from outside sources. For instance, failure to secure deliveries from brass rolling mills for a time almost halted production at plants producing radiators for one tractor maker and this, in turn, threatened to halt tractor production. Components involved vary with individual manufacturers, but last week strikes in plants producing tractor transmissions, bearings, carburetors, brakes, and starters worried various farm equipment makers.

Reconversion has been no problem to the industry because of the high level at which normal production was allowed to continue during the war. What little plant clearance was required by war contract termination has been virtually completed.

Massey-Harris Co., Racine, will more than double its prewar production space there through utilization of a plant which it acquired outright for tank production as a new tractor and mounted implement production unit. Tooling of this new plant for tractor production requires the outside purchase of over $600,000 worth of machine tools, about one-third of which have been ordered.

International Harvester Co. is embarking upon a 100 million dollar program to expand farm equipment manufacturing facilities, including two large new plants at Wood River, Ill., near Alton, and at Memphis, Tenn. Construction of both plants is in the early stages, but machine tools have not yet been purchased. The company's new cotton picker will be produced at Memphis, along with other tools not fully determined. The company also has purchased a 275-acre manufacturing site at Fort Madison, Iowa, but has not announced building plans there. International also has bid for the government-owned Buick aviation engine plant at Melrose Park, near Chicago. Westinghouse Electric Corp. also is said to be interested in this plant.

Deere & Co. has construction under way on its 10 million dollar tractor plant at Dubuque, Iowa, and has been active in the machine tool market.

Allis-Chalmers Mfg. Co. will expend $10 million to enlarge its La Porte, Ind., plant two or threefold to allow greater production of harvesting equipment.

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ELECTRONIC HEATTREAT: *Studebaker Corp. has reduced the time to case harden auto starter ring gears to 20 sec. High frequency current reverses the magnetic field of the coil 540,000 times per sec. The gear teeth reach a temperature of 1500° F in 13 sec. and are then automatically quenched by a water spray.*

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Current Labor Anomaly Disclosed by USES Regional Director

Cleveland

• • • Preliminary surveys of the current labor market show that while employers are becoming increasingly selective in their hiring specifications, workers are reluctant to accept peacetime jobs which result in a substantial reduction in the standard of living they reached during the war.

Based on reports from 16 major industrial areas, these and other results of the survey which serve to explain the enigma of 224,000 men and women claiming unemployment compensation while 66,000 jobs are open in those areas, were revealed this week by J. Kimball Johnson, United States Employment Service director for the Ohio-Michigan-Kentucky region.

According to Mr. Johnson, these reports also showed that on Oct. 1, approximately 450,000 persons were unemployed in the 16 largest areas, including Cleveland, Cincinnati, Columbus, Dayton-Springfield, Toledo, Youngstown, Akron, Canton-Massillon-Alliance, Ohio; Louisville, Ky.; Detroit, Flint, Grand Rapids, Lansing, Muskegon, Pontiac, and Saginaw-Bay City, Mich.

Total compensable claims in the three-state region were 224,000, although not all of this number were paid benefits. The number of women drawing job insurance was 54 pct of the total, whereas in certain areas, as high as 75 pct of the claimants were women.

Of the 66,000 jobs open in the 16 largest areas, only 12,000 were for women. Thus, while 54 pct of the total compensable claimants were women, only 18 pct of the job openings were for women workers.

Seventy-five pct of the men drawing benefits are 45 yr old or older, although empolyers are seeking younger men.

With estimates of 400,000 veterans being returned to the three-state region by the first of the year, the total number of job seekers may reach close to one million by Jan. 1, more than half of which will be women and older men.

"Employers today," said Mr. Johnson, "are more selective in their hiring than they were during the war. For example, in one area we found that 21 pct of the employers want a higher degree of skill, 46 pct want more experienced workers, 61 pct who hired workers as young as 16 and 18 years, now want no one under 21 or 25. Seventy pct of the firms now hire fewer women and 22 pct have increased their education requirements. Some now are checking carefully the applicants' references about absenteeism records."

"In many instances," he continued, firms have added height and weight limitations on orders for laborers. Personality and appearance requirements are more numerous on white-collar workers. A few firms have added a minimum residence requirement of two to five years.

"On the other hand," the regional USES director pointed out, "the unemployed are more particular as to the jobs they accept. In one area a sample of 50 men and women who had turned down from one to three job referrals each, revealed various reasons for such refusal, including inability to work on night shifts, and refusal to accept substantial reduction in hours worked and rate of pay. In that area, three-fourths of the unemployed were women and one-fourth were male workers, of whom the vast majority were considered by employers to be overage."

Mr. Johnson predicted employment in some durable goods industries may be expected to reach prewar levels by February or March. Included in this category are manufacture of automobiles, trucks, household and communications equipment and furniture. Other industries such as textiles, railroads, and coal mining report continued unsatisfied demands for workers. In the rubber industry, because of reduction in hours worked per week, 2,000 additional workers are needed currrently.

"Reports which the large manufacturing establishments give us," he said, "forecast a rise of 11 pct in their total employment for the period Sept. 15 to Nov. 15, but this will not absorb the unemployed women nor all of the older male job seekers. Employment will begin its upward swing just as soon as these plants move out their wartime equipment, retool, reinstall machinery, and are assured adequate supplies of parts and materials."

In preparation for this, and to bring out the facts underlying the current labor anomaly, USES state directors have been instructed to immediately begin detailed studies of job opportunities and the available job seekers in the 16 major industrial areas of this region. Results will be reported to members of labor-management committees, labor organizations, employer-trade associations and all others interested.

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SWEDISH SKILLS: *Robert Gaylord, chairman of the board of the National Assn. of Manufacturers, visits the Aga-Baltic Co., Stockholm, Sweden, on a tour of Scandinavian countries as a guest of Swedish Federation of Industries.*

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GM Truck & Coach Div. Erects New Plants To Double Prewar Output

Pontiac, Mich.

• • • Ground has been broken for the first of four new buildings which will add 1,500,000 sq ft of space to the coach manufacturing facilities of GMC Truck & Coach Div. of General Motors Corp. A new assembly plant, scheduled for completion in December, has already been begun, and thereafter a new engine plant for GMC engines will be built, together with a new engineering building and small adjoining experimental shop.

The extensive modernization and expansion program outlined by M. D. Douglas, general manager, will provide facilities for the greatest truck production in GMC history, with output potential double that of the best previous sales year. During the 5-yr period from 1938 to 1942 inclusive, GMC Truck & Coach produced 34 pct of the total of integral design city service and inter-city coaches.

The new assembly plant, where GM cruiser type coaches will be built on conveyor lines, will be an ultra modern one story steel and brick structure covering an area comparable to three city blocks, providing approximately 360,000 sq ft of space.

The new engine plant, to be constructed a little later, will be of steel frame design 600 ft long and 420 ft wide, providing 500,000 sq ft of floor space. The first floor will be used to manufacture engine parts, while on the second floor GMC engines will be assembled and fitted with accessories. A conveyor will carry the engines directly to the truck asembly lines.

The new engineering building will be a one story air conditioned structure of flat slab concrete construction. Its 198,000 sq ft of floor space will be used for offices, drafting rooms, laboratories, and experimental assembly, sheet metal and machine shops. Dynamometer laboratories will be housed in an adjacent building.

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Westinghouse has examined some 16 or 17 new plant sites for the motor division, but as yet has not settled on any particular one. Very recently a government-owned plant in the Chicago area was considered.

An expenditure of $2,000,000 during the balance of this year is contemplated at East Pittsburgh for rearranging factories and rehabilitating equipment and other manufacturing facilities. Present plans call for another six or seven million dollars to be spent during 1946 at East Pittsburgh. This is part of a broad program instituted recently by Westinghouse for expansion and modernization of plants all over the country. The complete program of expansion was detailed in THE IRON AGE, Aug. 23, 1945, p. 121.

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The increase is the second granted in pig iron ceilings since price control began with issuance of a pig iron price schedule June 24, 1941, formalizing a voluntary agreement that pig iron would not be sold above prices in effect on that date. The first increase of $1 per gross ton was granted on Feb. 14, 1945, at which time OPA indicated that re-examination of costs would be undertaken. This increase is based on the results of that study, OPA added.

Increased coal prices and the deterioration in coal quality has increased the quantity of coke needed for the production of pig iron. These factors in addition to increased labor costs made the upward adjustment necessary, OPA said.

The OPA price increase coincided with action of the Civilian Production Administration in including pig iron and graphite crucibles among 10 items that were placed under the preference rating system to permit the equitable distribution of these items during reconversion.

Previously, preference ratings did not apply to these products since they were under other types of WPB control or were handled by the industry itself, CPA explained. The action permits anyone who qualifies under the priorities system's regulation PR 28 to apply to CPA for rating to obtain these products. Every order bearing a preference rating must be accepted and filled regardless of existing contracts and orders, except in certain cases specified in PR 1.

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The subsidy program proposed by SPA described by Mr. Wilson as a "cradle to the grave program which, once started, can never be terminated" provides for government guarantee against losses, purchase options based on the record of earnings under subsidized leases, government procurement of bauxite, the subsidized manufacture of aluminum for sale at prices equal to or lower than Alcoa's cost of manufacture, reduced power rates on government-owned power to operators of government plants, and government stockpiling of aluminum ingot purchased from operators of the government plants.

The whole program of subsidies, Mr. Wilson stated, tells a prospective operator with emphatic finality that he has no chance to survive unless he cares to invest in a series of government doles. The proposed subsidies which extend from raw materials to sales of finished products, start with the government purchase of bauxite, followed with a government price on alumina pegged at or below Alcoa's costs, a contract for government water power which will defeat the amortization program now in effect, leases whereunder the government incurs all the risk of loss, with options to purchase the plants on a basis which gives the lowest purchase price to the poorest and most extravagant operator and end with a market built up around a government stockpile, the letter concludes.

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GM Truck & Coach Div. Erects New Plants To Double Prewar Output

Pontiac, Mich.

• • • Ground has been broken for the first of four new buildings which will add 1,500,000 sq ft of space to the coach manufacturing facilities of GMC Truck & Coach Div. of General Motors Corp. A new assembly plant, scheduled for completion in December, has already been begun, and thereafter a new engine plant for GMC engines will be built, together with a new engineering building and small adjoining experimental shop.

The extensive modernization and expansion program outlined by M. D. Douglas, general manager, will provide facilities for the greatest truck production in GMC history, with output potential double that of the best previous sales year. During the 5-yr period from 1938 to 1942 inclusive, GMC Truck & Coach produced 34 pct of the total of integral design city service and inter-city coaches.

The new assembly plant, where GM cruiser type coaches will be built on conveyor lines, will be an ultra modern one story steel and brick structure covering an area comparable to three city blocks, providing approximately 360,000 sq ft of space.

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Industrial Briefs...

• RESEARCH LAB. — Construction of a research laboratory by Kennametal, Inc., Latrobe, Pa., manufacturers of cemented carbides, has been started. The unit will be used for experimental research and for routine production control. Complete air conditioning will maintain uniform temperature and humidity throughout the year, and highly specialized equipment will be installed for metallographic and spectrographic research, X ray analyses, physical testing and other specialized investigations.

• FULL RECONVERSION — Complete reconversion to the manufacture of heating ventilating registers and grilles, metal perforations and stampings has been achieved by Standard Stamping & Perforating Co. Increased efficiency and precision processing is attributed to war-inspired methods and machinery inaugurated by the company to its contracts for production of airplane landing mats, guard rails for the Bailey Bridge, and tooling for manufacture of 155 mm rocket shells.

• TERMINATION CLAIMS—Firms with canceled war contract settlements pending have been urged by the Chicago Assn. of Commerce to file their claims before Nov. 1, if possible. Contract termination regulations are scheduled to become more stringent after Nov. 1, according to the association, and personnel handling contract termination settlements for the government is expected to be reduced. The association warned its members against the practice of obtaining advance partial payments on canceled contract claims and then delaying follow-up procedure required to effect a final settlement.

• OPENS FREQUENCY LAB.—A new laboratory to which all western industry may bring for study its problems of speeding peacetime production by making use of the newest scientific methods of high frequency heating has been opened by the Westinghouse Electric Corp. in Los Angeles. In charge of the laboratory is Dr. Russell A. Nielsen, formerly of the company's research laboratories at East Pittsburgh, Pa., assisted by a staff of engineers.

• ENGINE OUTPUT—The Sterling Engine Co., Buffalo, is reported preparing to diversify output with marine and stationary engines in the lower-priced field rated at 35 to 150 hp. Sales for the current year are estimated at $5,000,000 compared with $16,900,000 in 1944. Most of the company's war contracts were canceled.

• CONSOLIDATES — Remington Rand, Inc., has completed the transfer of all sales division offices and several other departments from Buffalo to New York. General offices of the company remain in Buffalo, together with the traffic, mechanical service, mechanical control and treasurer's depts.

• ACQUISITION — The Eagle-Picher Co., Cincinnati, has acquired a substantial interest in the common shares of McArthur, Irwin, Ltd., Montreal, Canada, which purchase represents a forward step in the postwar expansion program of Eagle-Picher and an interest in the lead business of Canada.

• BRICK PLANT—Construction of a brick plant on property at Moss Landing, Calif., located on the Monterey Bay coastline near Watsonville, and transfer of present facilities at Milpitas to the new scene of operations early next year, has been announced by the Permanente Cement Co. The development is the outgrowth of plans made more than a year ago, when Henry J. Kaiser and his associates announced their entry into the refractory business.

Elimination of War Exchange Tax Will Benefit Canadians

Ottawa

• • • **Canadian importers** of machinery, factory equipment and iron ore from the United States will be the chief beneficiaries from the removal of the 10 pct war exchange tax, which was announced in the budget address in the House of Commons by Finance Minister Ilsley. Under the new proposal the 8 pct sales tax is removed from machinery and apparatus, but remains on office equipment and motor vehicles.

Behind the lifting of these two taxes is a desire on the part of the Canadian government to cut the costs of capital expenditures of new plants and equipment. A large amount of United States made machinery is being imported into Canada at the present time and the 10 pct premium on American funds added heavily to the cost of new plant installations.

The 10 pct war exchange tax was first imposed in 1940 with the intention of conserving American dollar exchange for the purchase in the United States of badly needed munitions of war. But it was never the intention to continue it permanently. Mr. Ilsley said the removal of the tax will have some immediate benefit for the consumer, particularly in increasing the available supply.

Many United States articles are priced higher than Canadian retail price ceilings and when they are imported it is necessary for the government to pay a subsidy to keep the price to the Canadian consumer below the ceiling. The removal of the tax may lessen the need for the subsidies.

Dealing with the removal of the 8 pct sales tax on imported and domestic-made machinery, Mr. Ilsley said this tax is having a discouraging effect on the rapid and efficient modernization of the country's productive equipment. The Minister of National Revenue will determine what machinery shall be exempt, but in general it will include all equipment used directly in the manufacture or production of goods, but not machinery used in distribution or in the rendering of services. Exemption from the tax became effective Oct. 14.

Krug Reports on Wartime Steel Production and Consumption

Washington

• • • In his report on wartime production and prospects for reconversion, J. A. Krug, chairman of the War Production Board said that "there was never a time, in war or peace, when materials supplies, plant facilities, and manpower were in perfect balance. During the war, when demand for manufactured products was virtually insatiable, a surplus of one of these elements inevitably created a shortage of the other two."

He said that steel came into the limelight in early 1941, when President Roosevelt requested Gano Dunn to prepare a report on 1941 and 1942 steel supply and requirements. Until this time, there had been little dispute concerning the industry's ability to meet all demands. In his report, submitted on Feb. 22, 1941, Dunn concluded that there would be a surplus of some 2.1 million ingot tons in 1942, if furnaces then producing or under construction were operated at "reliable" capacity. At the same time, however, some contrary opinions were being expressed, and doubt began to be raised as to the adequacy of steel capacity.

Further growth in both the defense program and indirect steel demands lifted ingot production to capacity levels in the middle of the second quarter of 1941. Due to these considerations, the OPM, after careful study, recommended the addition of one blast furnace in Utah, and a large-scale integrated plant on the West Coast, and, by May 1941, had taken under active consideration projects located elsewhere in the country.

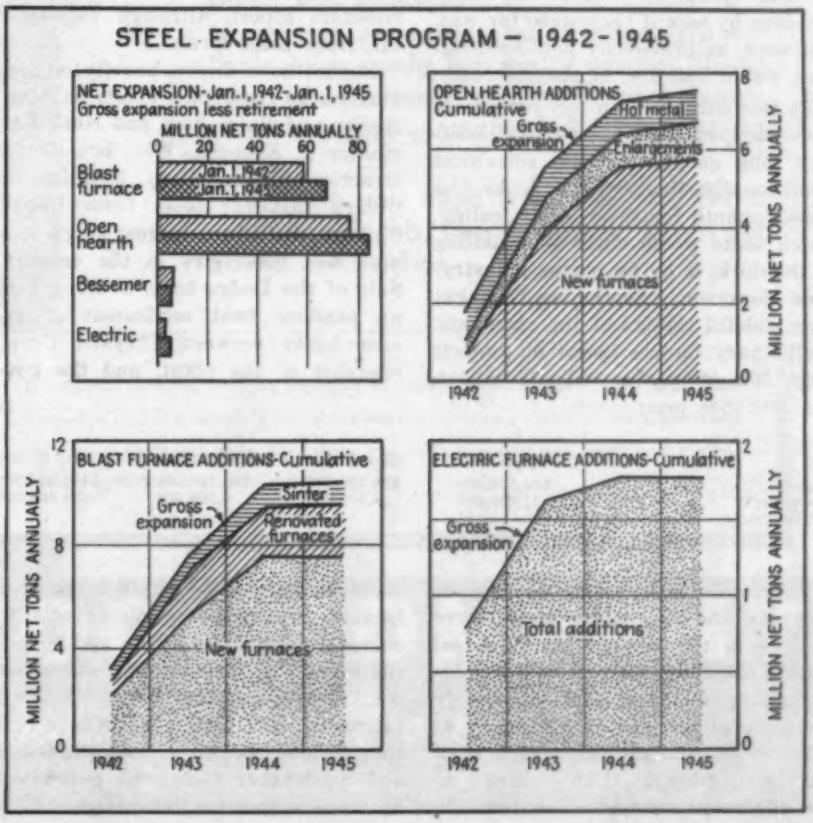
At this juncture, Dunn prepared a second report painting a much less favorable project. Owing to the marked growth in direct defense demands and the establishment of lend-lease, he concluded 1941 ingot supply would fall short of demand by at least 1.4 million tons, and in 1942 the deficit would reach 6.4 million tons. In his balance sheets, direct defense needs were placed at 12.4 million tons for 1941, and 13.8 million tons for 1942, while the domestic civilian figures stood at 68.1 million tons and 78.4 million tons, respectively.

The second Dunn report had the effect of crystallizing much of the general thinking then current with respect to the whole steel situation. Upon its receipt, the President intimated broadly that basic ingot production would have to be expanded, full priorities might have to be applied in the case of steel, and civilian supplies would have to be cut sharply. Shortly thereafter, quotas limiting production of automobiles, refrigerators, and other durable consumers' goods were set beginning in August 1941. On June 3, the OPM, in accordance with a presidential request, asked the Steel Industry Defense Committee to investigate the possibility of expanding ingot capacity by 10 million tons per annum.

Before this work had made much headway, however, the supply-demand position shifted rapidly from one of precarious balance to one of substantial and growing deficit. Manufacturers of civilian products began pressing mills to accept orders in much heavier volume than had been foreseen. The growing shortage of pig iron and scrap combined with seasonal factors to hold steelmaking operations well below the levels reached in late spring. As a result, producers began to experience extreme difficulty in meeting even a substantial fraction of their commitments for direct military, export, and war-supporting needs. In some products, notably plates, the situation threatened to become impossible.

Resolution of these difficulties, it was recognized, would require action much more immediate and more far-reaching than contemplated before that time. Six major steps were taken: Institution of a 6.5 million-ton expansion of blast furnace capacity; establishment of a full allocation system for pig iron; issuance of M-21, the general steel preference order; placement of all lend-lease tonnage under allocation; institution of a complete and mandatory priorities system for steel plate; further substantial cuts in the production quotas for

(CONTINUED ON PAGE 124)



MACHINE TOOLS

. . . News and Market Activities

Reconversion Tooling Underway Before German Defeat; Few Cancellations

Cleveland

• • • With each monthly release of the machine tool industry's vital statistics, it becomes increasingly apparent that tremendous reconversion buying was underway long before VJ day and prior, even, to victory in Europe.

No crystal ball is needed to arrive at this conclusion. Based on cancellations, which constitute a reliable but painful index, the buying during 1944 was done with an eye toward reconversion and this same business, incidentally, is now being taken out of the builders' hides in renegotiation. Certainly cancellations have not been as high as would be expected had the 1944 buying been really for war.

Making the reasonable and patriotic assumption that all machine tool orders placed during 1942 and 1943 were essential to the war production program, machines scheduled during 1944 for delivery in the early months of 1945 should be back in the builders' laps by now if they were for war. But such, as previously published figures would indicate, is not the case.

At this early date, a few companies have stopped plotting postwar markets long enough to say, somewhat conditionally, that October looks like a good month for them. This feeling, which some would class as whistling in the dark, is by no means industry-wide however. September brought some doleful tidings at the start, and preliminary figures based on reports from 200 companies indicate that a good cut has been taken:

	Shipments	New Orders	Cancellations	Unfilled Orders
August	$32,500,000	$29,500,000	$26,200,000	$217,500,000
September*	27,800,000	24,500,000	9,500,000	199,400,000

* Estimated.

For those in the industry who do not take the long-range view, there is little in the present machine tool market to crow about; RFC's sales are going up fast, and completely equipped plants are being leased at rates which scarcely discourage even the faint-of-heart, OPA ceilings to the contrary; customer attitude in many cases has reached the point of waiting for the real machine tool surpluses to develop.

Saddled with this situation, one competent but pessimistic observer has already suggested that the industry close up shop until new machines can be designed, feeling apparently that the zenith of the builders' reconversion boom has since been passed. No one actually knows, of course, just what the reconversion boom, if any, has been, but if there was or is one, its quantitative demands are now being satisfied by the RFC.

Dealers' prospects have been even gloomier, but it was reported here this week that there are going to be some changes made in that dealers are going to sell surplus machines at Clayton formula prices and get their remuneration directly from the Surplus Property Administration. This will serve to hold the Clayton formula, which would not be the case if dealers were given their commission off top price. This is a good plan, since dealers are not so likely to give some of their commission away if they have to collect it after the sale.

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Reports Machine Tool Sales in Chicago Area Not Yet Satisfactory

Chicago

• • • Standard machine tool sales in the Chicago area are holding up relatively better than some other parts of the country, dealers and distributors report, although volume is far from peak levels.

Buyers have drawn heavily on surplus stocks from such plants as Studebaker and Buick here and Nash-Kelvinator at Kenosha, Wis., but Reconstruction Finance Corp. is piling up orders fast for tools from Dodge, Chicago, one of the largest single surplus tool reservoirs in the country. Sale of the Dodge tools is being held up pending final settlement of responsibility between Chrysler Corp., operator of the plant, and the government. Surplus tools are being used largely to replace obsolete tools in currently operating plants and do not represent business which otherwise would have gone to new tool manufacturers, RFC officials indicate. A considerable portion of both the Buick and Studebaker tools was purchased by those respective companies.

Tooling purchases have not yet been made on several large projects including the Deere & Co. plant at Dubuque, Iowa, and the International Harvester Co. plant at Wood River, Ill., both now under construction, nor have purchases for the Massey-Harris Co. plant at Racine, Wis. been fully committed.

RFC sales procedures on used tools have not yet been fully speeded up to the extent desired by buyers, comments indicate. Other criticism centers around failure to consolidate inventories of tools of related types and lack of full familiarity with surplus inventories.

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Sells 76 Machine Tools

Boston

• • • During the period, Sept. 16 through Sept. 30, the RFC disposing loan agency at Boston sold 52 concerns a total of 76 machine tools. The most distant buyer was the Bustin-Bacon Co., Kansas City, which purchased a stripping machine for $1000. New England plants took the bulk of the tools sold, with Pennsylvania runnerup.

Dealers Handle RFC Tools

Washington

• • • Revision of machine tool disposal procedures by RFC to permit granting of discounts to machine tool dealers is expected to be announced shortly.

Facts ON SPECIAL CARBIDE-TIPPED TOOLS BY SUPER!

SPECIFY SUPER BECAUSE...

When your cutting job requires special tools for cutting cast iron, steel or non-ferrous materials you'll want SPEEDY PRODUCTION, FINE FINISHES, PRECISION . . . REAL ECONOMY.

Super Tool engineers have the knowledge —the production experience, to analyze your needs and to produce the special tools necessary to give you the utmost in efficiency and economy.

Super has manufactured Carbide-Tipped Tools exclusively for many years. These years of experience, research and development are your guarantee of tools that do a job.

Next time you need a special tool for a really tough job, specify Super. You'll get SUPER satisfaction.

In addition to manufacturing all types of special carbide-tipped tools, Super Tool Company makes a complete line of standard carbide-tipped bits, reamers, plain and side mills, shell end mills, face mills, end mills, counterbores, drills and centers. Specify SUPER and get real satisfaction.

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Road, Detroit 13, Michigan ★ 4105 San Fernando Road, Glendale 4, California

NONFERROUS METALS

. . . News and Market Activities

Allison Purchases Aluminum Foundry At Bedford, Ind.

Indianapolis, Ind.

• • • **Allison has purchased** the aluminum foundry at Bedford, Ind. and will produce aluminum castings for general industrial purposes, according to E. B. Newill, general manager of the Allison Div. of General Motors Corp.

The Bedford foundry which was operated during the war by Delco-Remy Div. of G. M. was purchased complete with all plants and equipment from DPC. It will be known as the Allison-Bedford foundry.

Primary purpose of the foundry, according to Mr. Newill, is to make available to industry the aluminum casting technique and processes which were developed during the war for liquid-cooled aircraft engines.

All Allison foundry operations will be under the executive supervision of C. M. Jessup, as manager of foundries, according to Mr. Newill. Sales and engineering offices will be under the supervision of E. A. Canning, director of sales and engineering. Dan Templeton and his staff have been transferred to Allison from Delco-Remy. Mr. Templeton was in charge of the foundry during the war years and will continue as Bedford Foundry Manager.

At the same time, Mr. Newill announced that management of the General Motors-owned Antioch foundry at Yellow Springs, Ohio had been assumed by Allison as research unit for specialized methods of making precision aluminum castings. Morris Bean will continue as manager.

Buy Silver Speculatively

New York

• • • **Ceiling prices** on foreign and domestic silver continue at 71.11c per troy oz, but there is some feeling in the trade that action may be taken by the silver block in Congress which will result in a revision of the Silver Purchase Act to authorize a ceiling of $1.20 per oz. The government is paying under the act as much as $1.29 per oz now for silver from U. S. mines.

As a result of this opinion there has been some speculative purchase of silver in what forms are now available in quantity—largely in grain and bar shape.

Meanwhile demand for silver continues active and prices are at or very close to the ceilings.

OPA Changes Wire Pricing

Washington

• • • **Superseding all others** governing sales of electrical wire and cable, OPA on Oct. 23 issued Maximum Price Regulation No. 82, effective Oct. 29. The pricing agency said the regulation is designed to simplify pricing methods and to make it possible for manufacturers entering this field to price their products in line with prices already established by other manufacturers. The regulation covers every type of wire conducting electricity, including aluminum and nickel alloy. The old regulations priced only copper, copper-clad and copper alloy wire.

Omitted, however, from the pricing lists of the new regulation are cable accessories and portable "trouble lamps" which have been transferred to revised maximum price regulation No. 136.

Pricing methods under the new regulation will be based, OPA said, on the prices of various types of electrical wire in effect on the base dates. These dates are Oct. 15, 1941, for copper wire and March 31, 1942, for electrical conductor wire of other metals which do not contain copper. An exception, however, will be used for wire, both bare and insulated, but even in this case the pricing procedure will be relatively the same as that heretofore employed.

Tin Can Salvage Urged

Washington

• • • **In removing distribution** controls last week on household tin can salvage because of the closing of its Salvage Division, WPB, speaking through its Tin-Lead-Zinc Division, requested the volunteer tin salvage committees to continue their efforts. This request was made in order to insure a steady flow of tin can scrap to the detinning plants.

Expect Demand For Copper to Continue

Toronto

• • • **Canadian copper** producers are becoming more optimistic with regard to future market possibilities. When British copper contracts were canceled at the beginning of the year producers in this country had visions of losing this market for several years, but stockpiles in the United Kingdom have been diminishing rapidly and there is hope for fresh buying to get underway from that quarter in the not distant future. While the U. K. has made it plain that it does not propose to buy anything from countries outside the sterling bloc that it can buy from within the bloc, it is believed that such a course would mean an insufficiency of metal for the British export trade and therefore the making of some arrangements for Canadian copper purchases.

With the heavy buying of Canadian copper by the United States and expanding domestic demand, together with the fact that copper producers in this country have curtailed production, there has been noticeable tightening in the supply situation.

Canada's Cobalt Supply

New York

• • • **According to the** *Northern Miner* stocks of cobalt concentrates in the cobalt area of Ontario have been accumulating and are now upwards of 1000 tons and deliveries to American smelters of 200 to 300 tons of concentrates are being made by local mines at 90c a lb for the cobalt content. During the war the price of $1 per lb was obtained. Apart from the American outlet, Russia and South America are reported to have been in the market for Canadian concentrates on a basis of about 80 to 85c per lb. The Silanco Mining and Smelting Corp. Ltd. is stated to have completed plans for a smelter to produce cobalt oxides and recover the nickel, silver and arsenic content of concentrates. The plant would handle about 15 tons of concentrates a day, doing custom smelting as well as handling the company's own production. A start on construction is hoped to be made this year.

Primary Metals

(Cents per lb, unless otherwise noted)

Aluminum, 99+%, del'd (Min. 10,000 lb)	15.00
Aluminum pig	14.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars, per lb. contained Be	$17.00
Cadmium, del'd	90.00
Cobalt, 97-99% (per lb)	$1.50 to $1.57
Copper, electro, Conn. valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.8%, dollars per troy oz.	$ 2.25
Iridium, dollars per troy oz.	$90-$100
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9 + %, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb flask, f.o.b. New York	$100 to $104
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, New York, cents per oz.	71.11
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.65

Remelted Metals

(Cents per lb unless otherwise noted)

Aluminum, No. 12 Fdy. (No. 2)	9.00 to 10.00
Aluminum, deoxidizing No. 2, 3, 4	$6.00 to 9.50
Brass Ingot	
85-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
80-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.37
Copper, H.R.	....	17.37	....
Copper drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c.

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals; ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths, 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NONFERROUS SCRAP METAL QUOTATIONS

†(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.00
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.00
Automobile radiators	7.25
Zincy bronze borings	7.00
Zincy bronze solids	8.00

OPA Group 3†

Fired rifle shells	8.00
Brass pipe	7.25
Old rolled brass	6.75
Admiralty condenser tubes	7.25
Muntz metal condenser tubes	6.75
Plated brass sheet, pipe reflectors	6.25
Manganese bronze solids	7.00[1]
Manganese bronze solids	6.00[2]
Manganese bronze borings	6.25[1]

OPA Group 4†

Refinery brass	4.50*

*Price varies with analysis, [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.375

Aluminum*

Plant scrap, segregated

2S solids	8.00
Dural alloys, solids 14, 17, 18, 24S	4.00
25S turnings, dry basis	3.00
Low copper alloys 51, 52, 61, 63S solids	7.25
turnings, dry basis	5.75

Plant scrap, mixed

Solids	4.00
Turnings, dry basis	2.75

Obsolete scrap

Pure cable	8.00
Old sheet and utensils	6.00
Old castings and forgings	5.00
Pistons, free of struts	5.00
Pistons, with struts	3.00
Old alloy sheet	5.00

Magnesium*

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	1.50

Mixed, contaminated plant scrap

Grade 1 solids	3.00
Grade 1 borings and turnings	2.00
Grade 2 solids	2.00
Grade 2 borings and turnings	1.00

*Nominal.

Zinc

New zinc clippings, trimmings	6.50
Engravers, lithographers plates	6.50
Old zinc scrap	4.75
Unsweated zinc dross	5.00
Die cast slab	4.50
New die cast scrap	4.45
Radiator grilles, old and new	3.50
Old die cast scrap	3.00

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead including cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point in 500 lb. lots)

Copper, frt. allowed	
Cast, oval, 15 in. or longer	25½
Electrodeposited	18⅞
Rolled, oval, straight	19½
Curved	20⅝
Brass, 80-20, frt. allowed	
Cast, oval, 15 in. or longer	23⅝
Zinc, cast, 99.99, 15 in. or longer	16¼
Nickel, 99 per cent plus, frt. allowed	
Cast	47
Rolled, depolarized	48
Silver, 999 fine	
Rolled, 100 oz. lots, per oz.	80

Chemicals

(Cents per lb., f.o.b. shipping point)

Copper cyanide, 1-5 bbls.	34.00
Copper sulphate, 99.5, crystals, bbls.	7.75
Nickel salts, single, 425 lb. bbls., frt. allowed	13.50
Silver Cyanide, 100 oz. lots, per oz.	0.6033
Sodium cyanide, 96 per cent, domestic, 100 lb. drums	15.00
Zinc cyanide, 100 lb. drums	33.00
Zinc sulphate, 99 per cent, crystals, bbls., frt. allowed	6.35

Market Holds Firm; Shortage Apparent

New York

• • • The heavy demand for scrap continues to maintain prices at ceiling throughout the country. In spite of an increase in railroad scrap supply reported in St. Louis, some of the railroad specialties have increased in price, approaching the ceiling.

Landing mat scrap is entering into the picture as an excellent low phos scrap and is demanding $11.55 a ton f.o.b. Boston.

Some ordnance scrap is also putting in an appearance, but not in sufficient quantities to be a market factor, since much of it is alloy.

Heavy melting steel is becoming very critical in the Buffalo area as evidenced by the leading consumer's willingness to pay the springboard on 10,000 tons of new business.

The coal strike and the uncertain labor situation in the steel industry are clouding the issue as regards the future scrap picture.

●

PITTSBURGH—Scrap here is very scarce, with no grades going begging for buyers. High grade machine shop turnings are very much in demand, and the price strengthened slightly to the $14.50 to $15.00 range instead of the $14.00 to $15.00 range that has stood for the past several weeks. Depending upon whether or not steelworkers walk out next week after U. S. Steel Corp. gives its answer to CIO wage demands, one large consumer will be back in the market. This should tighten further the scrap supplies. Cast grades are scarce, but since abrasive manufacturers have temporarily gone out of the market there is an additional amount of this scrap available. This is taken, however, as fast as it appears. Landing mat scrap came into this and nearby districts in substantial quantities from Boston and Norfolk, the freight on all of which was upwards of $6.25. However, with an unprepared price of $11.55 at Boston, the price delivered to mills in western Pennsylvania and eastern Ohio districts was not too bad. When prepared, this landing mat material is excellent low phos scrap. There is some scrap coming from government disposal agencies, but in many cases it is going direct to the consumers without going through normal dealer-broker channels.

●

CHICAGO—Short supply of all principal openhearth grades continues to dominate the market, with orders available for all tonnage which can be secured. Springboards of $1.50 continue to prevail on openhearth and electric furnace grades. With blast furnaces not scheduled to resume operation until next week following the coal strike, continued openhearth demand is assured. Blowing out of blast furnaces, as a result of the coal strike, has narrowed the market for blast furnace grades, and remaining operators have been using heavy scrap charges in an effort to conserve coke. With a resumption of full operations late next week a softer market on blast furnace grades is expected. Large ordnance disposals continue to draw interest.

●

PHILADELPHIA—Demand for all grades of scrap has increased somewhat this week. Turnings and cast are still in heavy demand. It is anticipated that all mills will resume shipments within a few days. Prices for prepared scrap continue at ceiling.

●

DETROIT—Prices continued tight against the ceiling this week with a rise in demand from Valley points, following the end of the coal strike, matching sustained local demand. Unprepared scrap is going to dealer yards at top prices. Very few signs are evident yet of production scrap beginning to come out of the automotive plants, although a few lists for November anticipate somewhat larger tonnage.

●

BOSTON—Lively interest is shown by turnings consumers and brokers as well as cast and low phos plate, and by brokers in mat scrap, at ceiling prices. Unconfirmed report is that 7600 tons of Ft. Devens mat scrap was split two ways at $11.55 a ton f.o.b. Boston. Bids of $10.50 a ton lost out. Because of scarcity of cast and low phos, and government limitations, foundries are unable to stock for winter and are worried. Brokers who sold turnings for eastern Pennsylvania consumption are said to be short.

●

NEW YORK—Prices are still at ceilings. The drop in steel output is not expected to influence prices to any extent in view of the certainty that ingot output will climb upward again. Steel makers are not flush with supplies and even a labor disturbance in the steel industry resulting in shutdowns would probably not be interpreted as a bearish factor.

●

BUFFALO—Pressure for heavy melting steel is increasing as local supplies drop farther behind production needs. Many dealers already are scraping bottom to meet contract requirements. The leading consumer's latest concession—payment of the springboard on 10,000 tons of new business—lends weight to trade talk of a possible scrap famine here before spring rolls around again. Output of blast furnace material also is in arrears and cast iron is extremely tight. Over 50,000 tons of steel mill scrap remains to come via lake and canal before the navigation season closes.

●

CLEVELAND—Demand for all grades, particularly openhearth, continues to hold prices at ceiling here. Uncertain labor conditions have taken some consumers out of the market temporarily, but shipments generally are holding up. Mills are taking just about everything they can lay their hands on, and sales of electric furnace scrap to consumers in the valley have been reported. Production of turnings is fair. Some ordnance scrap is putting in an appearance, but not enough to be a market factor, since much of it is alloy. One alloy user in the valley is reported to have bought 18,000 tons of his termination inventory, which should make his scrap situation quite comfortable for a while.

●

ST. LOUIS—A freer movement of scrap iron to the St. Louis industrial district is reported this week, the increase coming from the railroads and southern dealers. Despite this and the fact that the mills are said to be "comfortably" situated as to inventories, the OPA prices still prevail except as to a few specialties.

●

CINCINNATI—With production scrap a very scarce item and other material being held tightly, the local market tends firmer. Brokers and dealers report that all bids are pushing at ceiling price, with consumers pressing for shipment on materials. While no stringency has yet been reported, since most users are carrying reasonably broad inventories, unless available material eases within the next 30 days, situations may almost become critical. Surplus material, while being of some help, is not coming out in sufficient quantities to relieve the situation which has also been complicated by a tightness in the pig iron supplies, following the coal strikes.

●

BIRMINGHAM—Supplies of openhearth grades are adequate for heavy demand here but blast furnace users are having difficulty in obtaining all their requirements. Practically all movement of openhearth and blast furnace material in the South is reported going at present to mills in the Birmingham and Atlanta areas, none to the North.

●

TORONTO—Demand for scrap iron and steel exceeds supply in the Canadian markets. Dealers state that receipts are slow and they have only small yard stocks on hand. Consumers are showing keen interest and are making special efforts to obtain steelmaking scrap for stockpiling for winter requirements. Industrial plant scrap supply has dropped off through curtailment in war production and supply of borings and turnings is declining steadily. Breaking up of surplus and obsolete war equipment, however, is providing fair tonnages for mill use and it is believed supply from this source will improve as time advances. Cast scrap and stove plate are scarce and dealers state that only small lots are appearing on the market. Shortage of cast scrap has been reflected in increased pig iron buying to meet melter requirements.

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages. Where asterisks are used on quotations below, this indicates a ceiling price to which must be added brokerage fee and adjusted freight.

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
RR. hvy. melting	21.00*
No. 2 hvy. melting	20.00*
RR. scrap rails	21.50*
Rails 3 ft. and under	23.50*
No. 1 comp'd sheets	20.00*
Hand bdld. new shts.	20.00*
Hvy. axle turn.	19.50*
Hvy. steel forge turn.	19.50*
Mach. shop turn.	$14.50 to 15.00
Short shov. turn.	17.00*
Mixed bor. and turn.	15.00*
Cast iron borings	16.00*
Hvy. break cast.	16.50*
No. 1 cupola	20.00*
RR. knuck. and coup.	24.50*
RR. coil springs	24.50*
Rail leaf springs	24.50*
Rolled steel wheels	24.50*
Low phos. bil. crops	25.00*
Low phos.	22.50*
RR. malleable	22.00*

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 1 bundles	18.75*
No. 2 dealers' bndls.	18.75*
Bundled mach. shop turn.	18.75*
Galv. bundles	16.75*
Mach. shop turn.	13.75*
Short shovels, turn.	15.75*
Cast iron borings	14.75*
Mix. borings & turn.	13.75*
Low phos. hvy. forge	23.75*
Low phos. plates	21.25*
No. 1 RR. hvy. melt.	19.75*
Reroll rails	22.25*
Miscellaneous rails	20.25*
Rails 3 ft. and under	22.25*
Locomotive tires, cut	$22.75 to 23.25
Cut bolsters & side frames.	20.25 to 20.75
Angles & splice bars	22.25*
Standard stl. car axles	24.00 to 24.50
No. 3 steel wheels	23.25*
Couplers & knuckles	23.25*
Agricul. malleable	22.00*
RR. malleable	22.00*
No. 1 mach. cast.	20.00*
No. 1 agricul. cast.	20.00*
Hvy. breakable cast.	16.50*
RR. grate bars	15.25*
Cast iron brake shoes	15.25*
Stove plate	19.00*
Clean auto cast.	20.00*
Cast iron carwheels	20.00*

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
No. 1 bundles	19.50*
No. 2 bundles	19.50*
Mach. shop turn.	$10.50 to 11.00
Shoveling turn.	12.50 to 13.00
Cast iron borings	11.50 to 12.00
Mixed bor. & turn.	11.50 to 12.00
Low phos. plate	22.00*
No. 1 cupola cast.	20.00*
Hvy. breakable cast.	16.50*
Stove plate	19.00*
Scrap rails	21.00*

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	$15.05*
No. 2 hvy. melting	15.05*
No. 1 and 2 bundles	15.05*
Busheling	15.05*
Turnings, shovelings	12.05*
Machine shop turn.	10.05*
Mixed bor. & turn.	10.05*
Cl'n cast, chem. bor.	$13.06 to 14.15*

Truck delivery to foundry

Machinery cast.	21.00 to 23.51*
Breakable cast	21.57 to 21.87*
Stove plate	20.00 to 23.51*

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting	$17.32*
No. 2 hvy. melting	17.32*
No. 1 bundles	17.32*
New busheling	17.32*
Flashings	17.32*
Mach. shop turn.	12.32*
Short shov. turn.	14.32*
Cast iron borings	13.32*
Mixed bor. & turn.	12.32*
Low phos. plate	19.32*
No. 1 cupola cast.	20.00*
Charging box cast.	19.00*
Hvy. breakable cast.	16.50*
Stove plate	19.00*
Automotive cast	20.00*

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 2 bundles	18.75*
Mach. shop turn.	13.75*
Shoveling turn.	15.75*
Cast iron borings	$13.50 to 14.00
Mixed bor. & turn.	13.75*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Cast, charging box	19.00*
Hvy. axle forge turn.	18.25*
Low phos. plate	21.25*
Low phos. punchings	21.25*
Billet crops	21.25*
RR. steel wheels	23.25*
RR. coil springs	23.25*
RR. malleable	22.00*

ST. LOUIS

Per gross ton delivered to consumer:

Heavy melting	$17.50*
Bundled sheets	17.50*
Mach. shop turn.	$9.00 to 9.50
Locomotive tires, uncut	18.00
Misc. std. sec. rails	19.00*
Rerolling rails	21.00*
Steel angle bars	21.00*
Rails 3 ft. and under	21.50*
RR. springs	21.00 to 21.50
Steel car axles	21.00 to 21.50
Stove plate	19.00*
Grate bars	15.25*
Brake shoes	15.25*
RR. malleable	22.00*
Cast iron carwheels	20.00*
No. 1 mach'ery cast	20.00*
Breakable cast	16.50*

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$17.00*
No. 2 hvy. melting	17.00*
No. 2 bundles	17.00*
No. 1 busheling	17.00*
Long turnings	$9.50 to 10.00
Cast iron borings	11.00 to 11.50
Bar crops and plate	17.50 to 18.00
Structural and plate	17.50 to 18.00
No. 1 cast	20.00*
Stove plate	17.00
Steel axles	18.00*
Scrap rails	18.50
Rerolling rails	20.50*
Angles & splice bars	18.50 to 19.00
Rails 3 ft. & under	21.00*
Cast iron carwheels	16.50 to 17.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
No. 2 hvy. melting	20.00*
Low phos. plate	22.50*
No. 1 busheling	20.00*
Hydraulic bundles	20.00*
Mach. shop. turn.	15.00*
Short shovel. turn.	17.00*
Cast iron borings	16.00*

NEW YORK

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$15.33*
No. 2 hvy. melting	15.33*
Comp. black bundles	15.33*
Comp. galv. bundles	13.33
Mach. shop turn.	10.33
Mixed bor. & turn.	10.33
Shoveling turn.	13.33*
No. 1 cupola cast.	20.00*
Hvy. breakable cast	16.50*
Charging box cast	19.00*
Stove plate	19.00*
Clean auto cast.	20.00*
Unstrip. motor blks.	17.50*
Cl'n chem. cast bor.	14.33*

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.25*
No. 1 bundles	19.25*
No. 2 bundles	19.25*
No. 2 hvy. melting	19.25*
Mach. shop turn.	14.25*
Shoveling turn.	16.25*
Cast iron borings	14.25*
Cast iron borings	15.25
Mixed bor. & turn.	14.25*
Stove plate	19.00*
Low phos. plate	21.75*
Scrap rails	20.75*
Rails 3 ft. & under	22.75*
RR. steel wheels	23.75*
Cast iron car wheels	20.00*
RR. coil & leaf spgs.	23.75*
RR. knuckles & coup.	23.75*
RR. malleable	23.00*
No. 1 busheling	19.25*

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
Compressed sheet stl.	19.50*
Drop forge flashings	19.00
No. 2 bundles	19.50*
Mach. shop turn.	14.50*
Short shovel.	16.50*
No. 1 busheling	19.50*
Steel axle turn.	19.00*
Low phos. billet and bloom crops	24.50*
Cast iron borings	15.50*
Mixed bor. & turn.	14.50*
No. 2 busheling	17.00*
No. 1 machine cast	20.00*
Railroad cast	20.00*
Railroad grate bars	15.25*
Stove plate	19.00*
RR. hvy. melting	20.50*
Rails 3 ft. & under	23.00*
Rails 18 in. & under	24.25*
Rails for rerolling	23.00*
Railroad malleable	22.00*
Elec. furnace punch	22.00*

SAN FRANCISCO

Per gross ton delivered to consumer:

RR. hvy. melting	$15.50 to $16.25
No. 1 hvy. melting	15.50 to 16.25
No. 2 hvy. melting	14.50 to 15.25
No. 2 bales	13.00 to 13.75
No. 3 bales	9.50 to 10.25
Mach. shop turn.	7.00
Elec. furn. 1 ft. und.	15.50 to 17.00
No. 1 cupola cast.	19.00 to 21.00

LOS ANGELES

Per gross ton delivered to consumer:

No. 1 hvy. melting	$13.00 to $14.00
No. 2 hvy. melting	12.00 to 13.00
No. 2 bales	11.00 to 13.00
No. 3 bales	9.00 to 10.00
Mach. shop turn.	4.50
No. 1 cupola cast.	19.00 to 21.00

SEATTLE

Per gross ton delivered to consumer:

RR. hvy. melting	$10.00
No. 1 & No. 2 hvy. melting	10.00
Elec. furn. 1 ft. und.	14.00 to 15.00
No. 1 cupola cast.	20.00*

Comparison of Prices . .

[Advances over past week in Heavy Type; declines in *Italics*. Prices are f.o.b. major basing points. The various basing points for finished and semifinished steel are listed in the detailed price tables.]

Flat-Rolled Steel: (cents per pound)	Oct. 23, 1945	Oct. 16, 1945	Sept. 18, 1945	Oct. 24, 1944
Hot-rolled sheets	2.20	2.20	2.20	2.10
Cold-rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.70	3.70	3.70	3.50
Hot-rolled strip	2.10	2.10	2.10	2.10
Cold-rolled strip	2.80	2.80	2.80	2.80
Plates	2.25	2.25	2.25	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c-r strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terneplate: (dollars per base box)				
Tinplate, standard cokes.	$5.00	$5.00	$5.00	$5.00
Tinplate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (cents per pound)				
Merchant bars	2.25	2.25	2.25	2.15
Cold-finished bars	2.75	2.75	2.75	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (cents per pound)				
Bright wire	2.75	2.75	2.75	2.60
Wire nails	2.90	2.90	2.90	2.55
Rails: (dollars per gross ton)				
Heavy rails	$43.00	$43.00	$43.00	$40.00
Light rails	45.00	45.00	45.00	40.00
Semifinished Steel: (dollars per gross ton)				
Rerolling billets	$36.00	$36.00	$36.00	$34.00
Sheet bars	36.00	36.00	36.00	34.00
Slabs, rerolling	36.00	36.00	36.00	34.00
Forging billets	42.00	42.00	42.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (cents per pound)				
Wire rods	2.15	2.15	2.15	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (per gross ton)	Oct. 23, 1945	Oct. 16, 1945	Sept. 18, 1945	Oct. 24, 1944
No. 2 foundry, Phila.	$27.59	$26.84	$26.84	$25.84
No. 2, Valley furnace	25.75	25.00	25.00	24.00
No. 2, Southern, Cin'ti	26.19	25.44	25.44	24.44
No. 2, Birmingham	22.13	21.38	21.38	20.38
No. 2 foundry, Chicago†	25.75	25.00	25.00	24.00
Basic, del'd eastern Pa.	27.09	26.34	26.34	25.34
Basic, Valley furnace	25.25	24.50	24.50	23.50
Malleable, Chicago†	25.75	25.00	25.00	24.00
Malleable, Valley	25.75	25.00	25.00	24.00
L. S. charcoal, Chicago	42.34	42.34	42.34	37.34
Ferromanganese‡	135.00	135.00	135.00	135.00

† The switching charge for delivery to foundries in the Chicago district is 60¢ per ton.
‡ For carlots at seaboard.

Scrap: (per gross ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$16.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	14.50
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	16.50
No. 1 hy. comp. sheet, Det.	17.32	17.32	17.32	11.25
Low phos. plate, Youngs'n	22.50	22.50	22.50	17.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Chicago	20.00	20.00	20.00	20.00
Coke, Connellsville: (per net ton at oven)				
Furnace coke, prompt	$7.50	$7.50	$7.50	$7.00
Foundry coke, prompt	9.00	9.00	9.00	8.25
Nonferrous Metals: (cents per pound to large buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin, Straits, New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

Composite Prices . .

[Starting with the issue of Apr. 22, 1943, the weighted finished steel index was revised for the years 1941, 1942 and 1943. See explanation of the change on p. 90 of the Apr. 22, 1943 issue. Index revised to a quarterly basis as of Nov. 16, 1944; for details see p. 98 of that issue. The finished steel composite prices for the current quarter are an estimate based on finished steel shipments for the previous quarter. These figures will be revised when the actual data of shipments for this quarter are compiled.]

	FINISHED STEEL	PIG IRON	SCRAP STEEL
Oct. 23, 1945	2.42471¢ per lb	$25.36 per gross ton	$19.17 per gross ton
One week ago	2.42471¢ per lb	$24.61 per gross ton	$19.17 per gross ton
One month ago	2.41571¢ per lb	$24.61 per gross ton	$19.17 per gross ton
One year ago	2.21189¢ per lb	$23.61 per gross ton	$15.67 per gross ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1945	2.42471¢ July 3	2.21189¢ Jan. 2	$25.36 Oct. 22	$23.61 Jan. 2	$19.17	$19.17
1944	2.30837¢ Sept. 5	2.21189¢ Oct. 5	$23.61	$23.61	19.17	$15.67 Oct. 24
1943	2.25513¢	2.25513¢	23.61	23.61	19.17	$19.17
1942	2.26190¢	2.26190¢	23.61	23.61	19.17	19.17
1941	2.43078¢	2.43078¢	$23.61 Mar. 20	$23.45 Jan. 2	$22.00 Jan. 7	$19.17 Apr. 10
1940	2.30467¢ Jan. 2	2.24107¢ Apr. 16	23.45 Dec. 23	22.61 Jan. 2	21.83 Dec. 30	16.04 Apr. 9
1939	2.35367¢ Jan. 3	2.26689¢ May 16	22.61 Sept. 19	20.61 Sept. 12	22.50 Oct. 3	14.08 May 16
1938	2.58414¢ Jan. 4	2.27207¢ Oct. 18	23.25 June 21	19.61 July 6	15.00 Nov. 22	11.00 June 7
1937	2.58414¢ Mar. 9	2.32263¢ Jan. 4	23.25 Mar. 9	20.25 Feb. 16	21.92 Mar. 30	12.67 June 8
1936	2.32263¢ Dec. 28	2.05200¢ Mar. 10	19.74 Nov. 24	18.73 Aug. 11	17.75 Dec. 21	12.67 June 9
1935	2.07642¢ Oct. 1	2.06492¢ Jan. 8	18.84 Nov. 5	17.83 May 14	13.42 Dec. 10	10.33 Apr. 29
1934	2.15367¢ Apr. 24	1.95757¢ Jan. 2	17.90 May 1	16.90 Jan. 27	13.00 Mar. 13	9.50 Sept. 25
1933	1.95578¢ Oct. 3	1.75836¢ May 2	16.90 Dec. 5	13.56 Jan. 3	12.25 Aug. 8	6.75 Jan. 3
1932	1.89196¢ July 5	1.83901¢ Mar. 1	14.81 Jan. 5	13.56 Dec. 6	8.50 Jan. 12	6.43 July 5
1931	1.99626¢ Jan. 13	1.86586¢ Dec. 29	15.90 Jan. 6	14.79 Dec. 15	11.33 Jan. 6	8.50 Dec. 29
1930	2.25488¢ Jan. 7	1.97319¢ Dec. 9	18.21 Jan. 7	15.90 Dec. 16	15.00 Feb. 18	11.25 Dec. 9
1929	2.31773¢ May 28	2.26498¢ Oct. 29	18.71 May 14	18.21 Dec. 17	17.58 Jan. 29	14.08 Dec. 3

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 pct of the United States output. Index recapitulated in Aug. 28, 1941 issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

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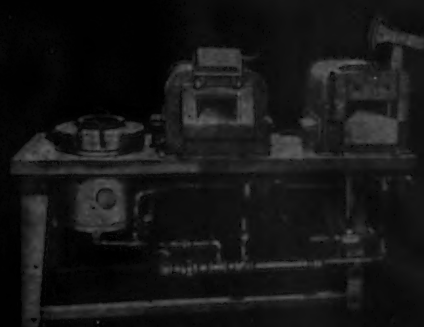

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Iron and Steel Prices . . .

Steel prices shown here are f.o.b. basing points, in cents per pound or dollars per gross ton. Extras apply. Delivered prices do not reflect 3 pct tax on freight. (1) Mill run sheet, 10¢ per 100 lb under base; primes, 25¢ above base. (2) Unassorted commercial coating. (3) Widths up to 12-in. inclusive. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25¢ per 100 lb to fabricators. (8) Also shafting. For quantities of 20,000 lb. to 39,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (11) Boxed. (12) This base price for annealed, bright finish wires, commercial spring wire. (13) Produced to dimensional tolerances in AISI Manual Sect. 6. (14) Billets only. (15) 9/32 in. to 47/64 in., 0.15c. per lb higher.

Basing Points	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	10 Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
INGOTS															
Carbon, rerolling	($31.00 f.o.b. mill)														
Carbon, forging	$36	$36	$36	$36	$36	$36	$36								
Alloy	$45	$45				$45	(Bethlehem, Massillon, Canton, Coatesville—$45)								
BILLETS, BLOOMS, SLABS							(Provo—$47.20, Duluth—$38[14])								
Carbon, rerolling	$36	$36	$36	$36	$36	$36	$36	$36				$48[14]	$38		
Carbon, forging	$42	$42	$42	$42	$42	$42	(Provo—$53.20, Duluth—$44[14]) $42					$54[14]	$44		
Alloy	$54	$54				$54	(Bethlehem, Massillon, Canton—$56)						$56		
SHEET BARS	$36	$36		$36		$36	$36	$36	(Canton—$36)						
PIPE SKELP	1.90¢	1.90¢					1.90¢	1.90¢	(Coatesville—1.90¢)						
WIRE RODS[15]															
No. 5 to 9/32 in.	2.15¢	2.15¢		2.15¢	2.15¢		(Worcester—2.25¢)				2.40¢	2.65¢			
SHEETS															
Hot-rolled	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.30¢	2.20¢		2.75¢	2.30¢	2.44¢	2.37¢
Cold-rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 gage)	3.70¢	3.70¢	3.70¢		3.70¢	3.70¢	3.70¢	3.70¢	3.80¢	3.70¢		4.25¢		3.94¢	3.87¢
Enameling (20 gage)	3.45¢	3.45¢	3.45¢	3.45¢			3.45¢		3.55¢	3.45¢		4.10¢	3.55¢	3.81¢	3.77¢
Long ternes[2]	3.80¢	3.80¢	3.80¢									4.55¢		4.16¢	4.12¢
STRIP															
Hot-rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold-rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester—3.00¢)					2.90¢	3.16¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity cold-rolled	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester—3.35¢)					3.05¢	3.31¢	
TINPLATE															
Standard cokes, base box	$5.00	$5.00	$5.00						$5.10					$5.38	$5.32
Electro, box 0.25 lb	$4.35	$4.35	$4.35												
Electro, box 0.50 lb	$4.50	$4.50	$4.50						$4.60						
Electro, box 0.75 lb	$4.65		$4.65						$4.75						
BLACKPLATE															
29 gage[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢[11]			3.37¢
TERNES, MFG.															
Special coated, base box	$4.30	$4.30	$4.30						$4.40						
BARS															
Carbon steel	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25	(Duluth—2.35¢)			2.60¢	2.90¢	2.35¢	2.59¢	2.57¢
Rail steel[6]	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢					2.60¢	2.90¢			
Reinforcing (billet)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢	2.25¢	2.39¢	
Reinforcing (rail)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	2.55¢	2.25¢		2.47¢
Cold-finished[8]	2.75¢	2.75¢	2.75¢	2.75¢		2.75¢			(Detroit—2.80¢)		(Toledo—2.90¢)			3.09¢	3.07¢
Alloy, hot-rolled	2.70¢	2.70¢				2.70¢	2.70	(Bethlehem, Massillon, Canton—2.70¢)					2.80¢		
Alloy, cold-drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.45¢		
PLATES									(Coatesville and Claymont—2.25¢)						
Carbon steel[13]	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢		2.25¢	2.25¢			2.60¢	2.80¢	2.47¢	2.44¢	2.30¢
Floor plates	3.50¢	3.50¢									3.85¢	4.15¢		3.86¢	3.82¢
Alloy	3.50¢	3.50¢			(Coatesville—3.50¢)						3.95¢	4.15¢		3.70¢	3.59¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	(Bethlehem—2.10¢)				2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R															
0.26 to 0.50 carbon	2.80¢			2.80¢			(Worcester—3.00¢)								
0.51 to 0.75 carbon	4.30¢			4.30¢			(Worcester—4.50¢)								
0.76 to 1.00 carbon	6.15¢			6.15¢			(Worcester—6.35¢)								
1.01 to 1.25 carbon	8.35¢			8.35¢			(Worcester—8.55¢)								
WIRE[9]															
Bright[12]	2.75¢	2.75¢		2.75¢	2.75¢		(Worcester—2.85¢)			(Duluth—2.80¢)		3.25¢			3.07¢
Galvanized	Add proper size extra and galvanizing extra to Bright Wire base														
Spring (high carbon)	3.35¢	3.35¢		3.35¢			(Worcester—3.45¢)					3.85¢			3.67¢
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.72¢

CORROSION AND HEAT RESISTANT STEELS

	Straight Chromium		Chromium Nickel			
	No. 304	No. 302	No. 410	No. 430	No. 442	No. 446
Ingot, P'gh, Chi, Canton, Balt, Reading, Ft. Wayne, Phila	Subject to negotiation			Subject to negotiation		
Blooms, P'gh, Chi, Canton, Phila, Reading, Ft. Wayne, Balt	21.25	20.40	15.725	16.15	19.125	23.375
Slabs, P'gh, Chi, Canton, Balt, Phila, Reading	21.25	20.40	15.725	16.15	19.125	23.375
Billets, P'gh, Chi, Canton, Newark, N. J., Watervliet, Syracuse, Balt	Subject to negotiation			Subject to negotiation		
Billets, forging, P'gh, Chi, Canton, Dunkirk, Balt, Phila, Reading, Watervliet, Syracuse, Newark, N. J., Ft. Wayne	21.25	20.40	15.725	16.15	19.125	23.375
Bars, h-r, P'gh, Chi, Canton, Dunkirk, Watervliet, Newark, N. J., Syracuse, Balt, Phila, Reading, Ft. Wayne	25.00	24.00	18.50	19.00	22.50	27.50
Bars, c-f, P'gh, Chi, Cleve, Canton, Dunkirk, Newark, N. J., Syracuse, Balt, Phila, Reading, Ft. Wayne, Watervliet	25.00	24.00	18.50	19.00	22.50	27.50
Plates, P'gh, Middletown, Canton	29.00	27.00	21.50	22.00	26.50	30.50
Shapes, structural, P'gh, Chi	25.00	24.00	18.50	19.00	22.50	27.50
Sheets, P'gh, Chi, Middletown, Canton, Balt	36.00	34.00	26.50	29.00	32.50	36.50
Strip, h-r, P'gh, Chi, Reading, Canton, Youngstown	23.50	21.50	17.00	17.50	24.00	35.00
Strip, c-r, P'gh, Cleve, Newark, N. J., Reading, Canton, Youngstown	30.00	28.00	22.00	22.50	32.00	52.00
Wire, c-d, Cleve, Dunkirk, Syracuse, Balt, Reading, Canton, P'gh, Newark, N. J., Phila	25.00	24.00	18.50	19.00	22.50	27.50
Wire flat, c-r, Cleve, Balt, Reading, Dunkirk, Canton	30.00	28.00	22.00	22.50	32.00	52.00
Rod, h-r, Newark, N. J. Syracuse	25.00	24.00	18.50	19.00	22.50	27.50
Tubing, seamless, P'gh Chi, Canton, (4 in. to 6 in.)	66.63	66.63	.....	63.30	.....	.....

SHELL STEEL

	per gross ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic openhearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.00 higher; East Michigan, $3 higher.

Price Exceptions: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	per lb.
Field grade	3.30¢
Armature	3.65¢
Electrical	4.15¢
Motor	5.05¢
Dynamo	5.75¢
Transformer 72	6.25¢
Transformer 65	7.25¢
Transformer 58	7.75¢
Transformer 52	8.55¢

F.o.b. Granite City, add 10¢ per 100 lb. on field grade to and including dynamo. Pacific ports add 75¢ per 100 lb. on all grades.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

*(*Also Canton, O.)*	*base per lb.*
High speed	67¢
Straight molybdenum	54¢
Tungsten-molybdenum	57½¢
High-carbon-chromium*	43¢
Oil hardening*	24¢
Special carbon*	22¢
Extra carbon*	18¢
Regular carbon*	14¢

Warehouse prices east of Mississippi are 2¢ per lb. higher; west of Mississippi 3¢ higher.

ROOFING TERNEPLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb	
No. 1 O.H., gross ton	$43.00
Angle splice bars, 100 lb	2.70
(F.o.b. Basing Points)	*per gross ton*
Light rails (from billets)	$45.00
Light rails (from rail steel)	44.00
	base per lb.
Cut spikes	3.25¢
Screw spikes	5.40¢
Tie plate, steel	2.30¢
Tie plates, Pacific Coast	2.45¢
Track bolts	4.75¢
Track bolts, heat treated, to railroads	5.00¢
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25¢.

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	*Pacific Coast Basing Points†*
	base per keg	
Standard wire nails	$2.90	$3.40
Coated nails	2.90	3.40
Cut nails, carloads	3.85	....

	base per 100 lb.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	base column	
Woven wire fence*	67	85
Fence posts, carloads	69	86
Single loop bale ties	66	91
Galvanized barbed wire**	72	82
Twisted barbless wire	72	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

CLAD STEEL

Base prices, cents per pound

	Plate	*Sheet*
Stainless-clad		
No. 304, 20 pct, f.o.b. Pittsburgh	18.00*	19.00
Nickel-clad		
10 pct, f.o.b. Coatesville, Pa.	18.00	....
Inconel-clad		
10 pct, f.o.b. Coatesville	25.00	....
Monel-clad		
10 pct, f.o.b. Coatesville	24.00	....
Aluminized steel		
Hot dip, 20 gage, f.o.b. Pittsburgh	....	9.00

*Includes annealing and pickling.

ALLOY EXTRAS

Alloy Steel	Basic Openhearth		Electric Furnace	
	Bars and Bar-strip	Billets, Blooms, and Slabs	Bars and Bar-strip	Billets, Blooms, and Slabs
NE 8600	0.65¢	$13.00	$1.15	$23.00
NE 8700	0.70	14.00	1.20	24.00
NE 9400	0.75	15.00	1.25	25.00
NE 9700	0.65	13.00	1.15	23.00
NE 9800	1.30	26.00	1.80	36.00
NE 9900	1.20	24.00	1.55	31.00

The extras shown are in addition to the base price of $2.70 per 100 lb on finished products and $54 per gross ton on semifinished steel, major basing points, as shown in table, opposite page, and are in cents per pound when applicable to bars and bar-strip and in dollars per gross ton when applicable to billets, blooms and slabs. When acid openhearth is specified and acceptable, add to basic openhearth alloy differential 0.25¢ per lb for bars and bar-strip and $5 per gross ton for billets, blooms and slabs.

WELDED PIPE AND TUBING

Base discounts, f.o.b. Pittsburgh district and Lorain, Ohio, mills

(F.o.b. Pittsburgh only on wrought pipe) base price—$200.00 per net ton

Steel (buttweld)

	Black	Galv.
½-in.	63½	51
¾-in.	66½	55
1-in. to 3-in.	68½	57½

Wrought Iron (buttweld)

½-in.	24	3½
¾-in.	30	10
1-in. and 1¼-in.	34	16
1½-in.	38	18½
2-in.	37½	18

Steel (lapweld)

2-in.	61	49½
2½-in. and 3-in.	64	52½
3½-in. to 6-in.	66	54½

Wrought Iron (lapweld)

2-in.	30½	12
2½-in. to 3½-in.	31½	14½
4-in.	33½	18
4½-in. to 8-in.	32½	17

Steel (butt, extra strong, plain ends)

½-in.	61½	50½
¾-in.	65½	54½
1-in. to 3-in.	67	57

Wrought Iron (same as above)

½-in.	25	6
¾-in.	31	12
1-in. to 2-in.	38	19½

Steel (lap, extra strong, plain ends)

2-in.	59	48½
2½-in. and 3-in.	63	52½
3½-in. to 6-in.	66½	56

Wrought Iron (same as above)

2-in.	33½	15½
2½-in. to 4-in.	39	22½
4½-in. to 6-in.	37½	21

On buttweld and lapweld steel pipe jobbers are granted a discount of 5 pct. On l.c.l. shipments prices are determined by adding 25 pct and 30 pct and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lapweld and one point lower discount, or $2 a ton higher on all buttweld.

BOILER TUBES

Seamless steel and lapweld commercial boiler tubes and locomotive tubes, minimum wall. Net base prices per 100 ft f.o.b. Pittsburgh, in carload lots.

	Seamless Cold-Drawn	Seamless Hot-Rolled	Lapweld, Hot-Rolled
2 in. O.D. 13 B.W.G.	15.03	13.04	12.38
2½ in. O.D. 12 B.W.G.	20.21	17.54	16.58
3 in. O.D. 12 B.W.G.	22.48	19.50	18.35
3½ in. O.D. 11 B.W.G.	28.37	24.62	23.15
4 in. O.D. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb or ft and over.....Base
30,000 lb or ft to 39,999 lb or ft... 5 pct
20,000 lb or ft to 29,999 lb or ft...10 pct
10,000 lb or ft to 19,999 lb or ft...20 pct
5,000 lb or ft to 9,999 lb or ft...30 pct
2,000 lb or ft or 4,999 lb or ft...45 pct
Under 2,000 lb or ft.....65 pct

CAST IRON WATER PIPE

Per Net Ton

6-in. and larger, del'd Chicago....$54.80
6-in. and larger, del'd New York.. 52.20
6-in. and larger, Birmingham 46.00
6-in. and larger, f.o.b. cars, San Francisco or Los Angeles..... 69.40
6-in. and larger f.o.b. cars, Seattle. 71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect 3 pct tax on freight rates.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts

Base discount less case lots

Percent Off List

½ in. & smaller x 6 in. & shorter...65½
9/16 & ⅝ in. x 6 in. & shorter....63½
¾ to 1 in. x 6 in. & shorter.....61
1⅛ in. and larger, all lengths.....59
All diameters over 6 in. long.....59
Lag, all sizes 62
Plow bolts 65

Nuts, Cold Punched or Hot Pressed

(Hexagon or Square)

½ in. and smaller 62
9/16 to 1 in. inclusive 59
1⅛ to 1½ in. inclusive 57
1⅝ in. and larger.....56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 pct for full container quantities. There is an additional 5 pct allowance for carload shipments.

Semifin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 in. through 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 pct additional discount.

Stove Bolts *Consumer*

Packages, nuts loose .....71 and 10
In packages, with nuts attached..... 71
In bulk 80

On stove bolts freight allowed up to 65¢ per 100 lb based on Cleveland, Chicago, New York on lots of 200 lb or over.

Large Rivets

(½ in. and larger)

Base per 100 Lb

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham $3.75

Small Rivets

(7/16 in. and smaller)

Percent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham .....65 and 5

Cap and Set Screws	*Consumer Percent Off List*
Upset full fin, hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes....	36
Fillister head cap, listed sizes.....	51

Freight allowed up to 65¢ per 100 lb based on Cleveland, Chicago or New York on lots of 200 lb or over.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Div. certifies in writing the consumers need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, cents per lb, ton lots.

Copper, electrolytic, 150 and 200 mesh .....21½¢ to 23½¢
Copper, reduced, 150 and 200 mesh .....20½¢ to 25½¢
Iron, commercial, 100 and 200 mesh 96 + % Fe .....12½¢ to 15¢
Iron, crushed, 200 mesh and finer, 90 + % Fe carload lots..... 4¢
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots ..... 63¢
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe 30 to 33¢
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe..... 42¢
Iron carbonyl, 300 mesh and finer, 98-99.8 + % Fe..... 90¢
Aluminum, 100 and 200 mesh.... *25¢
Antimony, 100 mesh ..... 30¢
Cadmium, 100 mesh $1.40
Chromium, 100 mesh and finer.... $1.25
Lead, 100, 200 & 300 mesh....11½ to 15¢
Manganese ..... 65¢
Nickel, 150 mesh ..... 51½¢
Solder powder, 100 mesh..8½¢ plus metal
Tin, 100 mesh ..... 58¾¢
Tungsten metal powder, 98%-99%, any quantity, per lb $2.60
Molybdenum powder, 99%, in 200-lb kegs, f.o.b. York, Pa., per lb. $2.60
Under 100 lb $3.00

*Freight allowed east of Mississippi.

COKE

	Net Ton
Furnace, beehive (f.o.b. oven)	
Connellsville, Pa.	$7.50*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	9.00
Foundry, Byproduct	
Chicago, del'd	13.75
Chicago, f.o.b.	13.00
New England, del'd	14.65
Kearny, N. J., f.o.b.	13.05
Philadelphia, del'd	13.28
Buffalo, del'd	13.40
Portsmouth, Ohio, f.o.b.	11.50
Painesville, Ohio, f.o.b.	12.15
Erie, del'd	13.15
Cleveland, del'd	13.20
Cincinnati, del'd	13.25
St. Louis, del'd	14.25
Birmingham, del'd	10.90

*Hand drawn ovens using trucked coal permitted to charge $8.60 per ton plus transportation charges.

REFRACTORIES

(F.o.b. Works)

Fire Clay Brick

Per 1000

Super-duty brick, St. Louis $68.50
First quality, Pa., Md., Ky., Mo., Ill. 54.40
First quality, New Jersey 59.35
Sec. quality, Pa., Md., Ky., Mo., Ill. 49.35
Sec. quality, New Jersey 51.95
No. 1 Ohio 45.60
Ground fire clay, net ton 8.05

Silica Brick

Pennsylvania and Birmingham ...$54.40
Chicago District 62.45
Silica cement, net ton (Eastern).. 9.55

Chrome Brick *Per Net Ton*

Standard chemically bonded, Balt., Plymouth Meeting, Chester $54.00

Magnesite Brick

Standard, Balt. and Chester $76.00
Chemically bonded, Baltimore 65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks (carloads) $43.48
Domestic, f.o.b. Chewelah, Wash.
in bulk 22.00
in sacks 26.00

LAKE SUPERIOR ORES

(51.50% Fe, Natural Content, Delivered Lower Lake Ports)*

Per Gross Ton

Old range, bessemer, 51.50 ..... $4.75
Old range, non-bessemer, 51.50.... 4.60
Mesaba, bessemer, 51.50 ..... 4.60
Mesaba, non-bessemer, 51.50 ..... 4.45
High phosphorus, 51.50 ..... 4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-48 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-48 Ann.
**Philadelphia	$3.518	$4.872[5]	$4.768[a]	$3.922	$4.772	$3.905	$3.668	$3.822	$4.172	$5.818	$6.868	$7.072	$8.172
New York	3.59	4.613[3]	5.110	3.974[6]	4.772	3.768	3.756	3.853	4.203	5.858	6.908	7.103	8.203
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.244	6.012	7.062	7.194	8.394
Baltimore	3.394	4.352	4.894	3.902	4.752	3.594	3.759	3.802	4.152	....	....	....	....
Norfolk	3.771	4.965	5.371	4.185	4.865	3.971	4.002	4.065	4.265	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3.85	5.80	6.65	6.65	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.987	5.837	6.887	6.887	7.987
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.558	3.35	3.85	5.808	6.858	6.65	7.75
Buffalo	3.35	4.40	4.75[4]	3.819	4.669	3.63	3.40	3.35	3.85	5.80	6.65	6.65	7.75
Detroit	3.45	4.50	5.00[4]	3.70	4.858[17]	3.609	3.661	3.45	3.90	5.93	6.98	6.959	8.059
Cincinnati	3.425	4.475[3]	4.825[3]	3.675	4.711	3.661	3.691	3.611	4.111	5.95	7.00	7.011	8.261
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.131	5.981	7.031	7.031	8.131
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.85	5.80	6.65	6.65	7.90
St. Paul	3.60	4.46	5.257[4]	3.86	5.102[17]	3.8113	3.8113	3.7613	3.461	5.94	5.99	7.361	8.461
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.543	....	....	....	....
Indianapolis	3.518	4.568	4.918	3.768	4.741	3.63	3.63	3.58	4.00	5.93	6.98	6.98	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.53	....	....	....	....
Memphis	3.965[7]	4.66	5.268	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	5.079	5.358	4.308	....	4.158	4.158*	4.108*	4.729	....	....	....	....
Houston	3.763	5.573	5.3131	4.313	....	4.25	4.25	3.75	6.473[3]	7.223	8.223	8.323	9.373
Los Angeles	5.00	7.203	6.10[4]	4.95	5.6131[3]	4.95	4.65	4.40	5.683	8.204	9.404	9.304	10.454
San Francisco	4.55[14]	7.304	6.354	4.50[14]	7.333[17]	4.65[14]	4.3514	4.1514	5.433	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.054	5.954	4.25[12]	....	4.7512	4.4512	4.3512	5.583	....	9.404	....	....
Portland	4.65[11]	6.604	5.754	4.75[11]	....	4.85[11]	4.4511	4.4511	5.633	8.304	9.404	8.304	9.404
Salt Lake City	4.530[17]	....	6.1713	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	6.00	....	....	....	....

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT-ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD-ROLLED: Sheets, 400 to 1499 lb; strip, extras on all quantities; bars, 1500 lb base.

NE ALLOY BARS: 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 199 lb. (7) 400 to 1499 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb and over. (15) 1000 lb and over. (16) 1500 lb and over. (17) 2000 lb and over. (18) 3500 lb and over.

(*) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271¢ for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

PIG IRON PRICES

* Maximum per gross ton, established by OPA Oct. 22, 1945.
† Prices do not reflect 3 pct tax on freight.

BASING POINT PRICES

Basing Point	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Bethlehem	$26.25	$26.75	$27.25	$27.75	....
Birdsboro	26.25	26.75	27.25	27.75	$31.25
Birmingham	20.75	22.13	....	26.75	....
Buffalo	24.75	25.75	26.25	26.75	31.25
Chicago	25.25	25.75	25.75	26.25	....
Cleveland	25.25	25.75	25.75	26.25	....
Detroit	25.25	25.75	25.75	26.25	....
Duluth	25.75	26.25	26.25	26.75	....
Erie	25.25	25.75	26.25	26.75	....
Everett	26.25	26.75	27.25	27.75	....
Granite City	25.25	25.75	25.75	26.25	....
Hamilton	25.25	25.75	25.75	....	....
Neville Island	25.25	25.75	25.75	26.25	....
Provo	23.25	23.75	....	....	....
Sharpsville [1]	25.25	25.75	25.75	26.25	....
Sparrows Point	26.25	26.75	....	....	....
Steelton	26.25	....	....	....	31.25
Swedeland	26.25	26.75	27.25	27.75	....
Toledo	25.25	25.75	25.75	26.25	....
Youngstown	25.25	25.75	25.75	26.25	....

DELIVERED PRICES (BASE GRADES)

Consuming Point	Basing Point	Freight Rate	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Boston	Everett	$ .50	$26.75	$27.25	$27.75	$28.25	....
Boston	Birdsboro-Steelton	4.02	....	....	....	....	$35.27
Brooklyn	Bethlehem	2.50	28.75	29.25	29.75	30.25	....
Brooklyn	Birdsboro	2.92	....	....	....	....	34.17
Canton	Cleveland	1.39	26.64	27.14	27.14	27.64	....
Canton	Buffalo	3.19	....	....	....	....	34.44
Cincinnati	Birmingham	4.06	24.81	26.19	....	....	....
Cincinnati	Hamilton	1.11	....	....	26.86	....	....
Cincinnati	Buffalo	4.40	....	....	....	....	35.65
Jersey City	Bethlehem	1.53	27.78	28.28	28.78	29.28	....
Jersey City	Birdsboro	1.94	....	....	....	....	33.19
Los Angeles	Provo	4.95	28.20	28.70	....	....	....
Los Angeles	Buffalo	15.41	....	....	....	....	46.66
Mansfield	Cleveland & Toledo	1.94	27.19	27.69	27.69	28.19	....
Mansfield	Buffalo	3.36	....	....	....	....	34.63
Philadelphia	Swedeland	.94	27.09	27.59	28.09	28.59	....
Philadelphia	Birdsboro	1.24	....	....	....	....	32.49
San Francisco	Provo	4.95	28.20	28.70	....	....	....
San Francisco	Buffalo	15.41	....	....	....	....	46.66
Seattle	Provo	4.95	28.20	28.70	....	....	....
Seattle	Buffalo	15.41	....	....	....	....	46.66
St. Louis	Granite City	.50	25.75	26.25	26.25	26.75	....
St. Louis	Buffalo	7.07	....	....	....	....	38.32

(1) Struthers Iron & Steel Co., Struthers, Ohio, may charge 50¢ a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

Charcoal pig iron base prices for Lyles, Tenn., and Lake Superior furnaces, $33.00 and $34.00, respectively. Newberry Brand of Lake Superior charcoal iron $39.00 per g.t., f.o.b. furnace, by order L 39 to RPS 10. Apr. 11, 1945, retroactive to Mar. 7, 1945. Delivered to Chicago, $42.34. High phosphorus iron sells at Lyles, Tenn., at $28.50.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50¢ a ton for each 0.25 pct silicon content in excess of base grade which is 1.75 to 2.25 pct); Phosphorus differentials, a reduction of 38¢ per ton for phosphorus content of 0.70 pct and over; Manganese differentials, a charge not to exceed 50¢ per ton for each 0.50 pct manganese content in excess of 1.00 pct. Effective Mar. 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 pct nickel content and $1 per ton extra for each additional 0.25 pct nickel.

Silvery iron and bessemer ferrosilicon up to and including 14.00 pct silicon covered by RPS 10 as amended Feb. 14, 1945. Silvery iron, silicon 6.00 to 6.50 pct, C/L per g.t., f.o.b. Jackson, Ohio—$30.50; f.o.b. Buffalo—$31.75. Add $1.00 per ton for each additional 0.50 pct Si. Add 50¢ per ton for each 0.50 pct Mn over 1.00 pct. Add $1.00 per ton for prices of comparable analysis.

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Carload lots (packed)	141.00
Less ton lots (packed)	148.50

$1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96% min. Mn, .2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	30¢
Ton lots	32¢

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carloads, f.o.b. shipping point with freight allowed.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.25c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si.	8.90c.	9.05c.	9.55c.
90-95% Si.	11.05c.	11.20c.	11.65c.

Spot sales add: 45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

Silvery Iron, Silicon 14.01 to 14.50 per cent, $45.50 per G. T. f.o.b. Jackson, Ohio. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add $1.00 per ton for low impurities, not to exceed: P—0.05%, S—0.04%, C—1.00%. Covered by MPR 405.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

(65-72% *Cr. 2% max. Si*)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10%	13.00c.	13.40c.	14.00c.
62-66% Cr, 5-7% C	13.50c.	13.90c.	14.50c.

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 2c. per lb. to regular low-carbon ferrochrome price schedule. Add 2c. for each additional 0.25% N. High-carbon type: 66-71% Cr, 4-5% C, 0.75% N. Add 5c. per lb. to regular high-carbon ferrochrome price schedule.

Low-Carbon Ferromanganese

Contract prices per lb. of manganese contained, lump size, f.o.b. shipping point, freight allowed to destination, Eastern Zone. Add 0.25c. for spot sales.

	Carloads, Bulk	Ton Lots	Less Ton
0.10% max. C, 1 or 2% max. Si	23.00c.	23.40c.	23.65c.
0.15% max. C, 1 or 2% max. Si	22.00c.	22.40c.	22.65c.
0.30% max. C, 1 or 2% max. Si	21.00c.	21.40c.	21.65c.
0.50% max. C, 1 or 2% max. Si	20.00c.	20.40c.	20.65c.
0.75% max. C, 7.00% max. Si	16.00c.	16.40c.	16.65c.

Ferrochrome Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 60 per cent contained chromium. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	8.25c.	8.55c.	8.95c.
Ton lots	8.75c.	9.25c.	10.75c.
Less ton lots	9.00c.	9.50c.	11.00c.

Ferromanganese Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 66 per cent contained manganese. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	6.05c.	6.30c.	6.60c.
Ton lots	6.65c.	7.55c.	8.55c.
Less ton lots	6.80c.	7.80c.	8.80c.

Calcium—Manganese—Silicon

Contract prices per lb. of alloy, lump size, f.o.b. shipping point, freight allowed to destination.

16-20% Ca, 14-18% Mn, 53-59% Si. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carloads	15.50c.	16.00c.	18.05c.
Ton lots	16.50c.	17.35c.	19.10c.
Less ton lots	17.00c.	17.35c.	19.60c.

Calcium Metal

Eastern zone contract prices per lb. of metal, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. Add 0.9c. for Central Zone; 0.49c. for Western Zone.

	Cast	Turnings	Distilled
Ton lots	$1.80	$2.30	$5.00
Less ton lots	2.30	2.80	5.75

Chromium—Copper

Contract price per lb. of alloy, f.o.b. Niagara Falls, freight allowed east of the Mississippi River. 8-11% Cr, 88-90% Cu, 1.00% max. Fe, 0.50% max. Si. Add 2c. for spot sales.

Shot or ingot	45c.

Ferroboron

Contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.20	$1.2075	$1.229
Less ton lots	1.30	1.3075	1.329

Manganese—Boron

Contract prices per lb. of alloy, f.o.b. shipping point, freight charges allowed. Add 5c. for spot sales.

75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.89	$1.903	$1.935
Less ton lots	2.01	2.023	2.055

Nickel—Boron

Spot and contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination.

15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, Balance Ni.

	Eastern Zone	Central Zone	Western Zone
11,200 lb. or more	$1.90	$1.9125	$1.9445
Ton lots	2.00	2.09125	2.0445
Less ton lots	2.10	2.1125	2.1445

Other Ferroalloys

Ferrotungsten, Standard grade lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungstein, 10,000 lb. or more	$1.90
Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.	
Open hearth	$2.70
Crucible	$2.80
Primos	$2.90
Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal	$1.50
Vanadium pentoxide, 88-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5	$1.10
Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)	
Carload lots	25c.
2000 lb. to carload	26c.
Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)	
Carload lots	58c.
2000 lb. to carload	59c.
Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis	
No. 1	87.5c.
No. 6	60c.
No. 79	45c.
Bortram, f.o.b. Niagara Falls	
Ton lots, per lb.	45c.
Less ton lots, per lb.	50c.
Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.	
2000 lb. lots	$2.25
Under 2000 lb. lots	$2.30
Ferrotitanium, 40-45%, 0.10%C. max. f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained Ti	$1.23
Less ton lots	$1.25
Ferrotitanium, 20-25%, 0.10%C. max., ton lots, per lb. contained titanium	$1.35
Less ton lots	$1.40
High-carbon ferrotitanium, 15%-20%, 6-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y. freight allowed East of Mississippi River, north of Baltimore and St. Louis, per carload	$142.50
Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton	$58.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Sigio), Tenn., $3 unitage freight equalized with Nashville, per gross ton	$75.00
Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo.	95c.
Calcium molybdate, 40-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo	80c.
Molybdenum oxide briquets, 48-52% Mo f.o.b. Langeloth, Pa., per lb. contained Mo	80c.
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo	80c.
Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales	
Carload lots	14c.
Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy	
Carload, bulk	4.6c.
Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk	5.75c.
Ton lots	7.25c.
Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.	
Car lots	8.00c.
Ton lots	8.75c.
Less ton lots	9.25c.

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BALDWIN

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Carload lots (packed)	141.00
Less ton lots (packed)	148.50

$1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96% min. Mn, .2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	30¢
Ton lots	32¢

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carloads, f.o.b. shipping point with freight allowed.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.25c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si.	8.90c.	9.05c.	9.55c.
90-95% Si.	11.05c.	11.20c.	11.65c.

Spot sales add: 45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

Silvery Iron, Silicon 14.01 to 14.50 per cent, $45.50 per G. T. f.o.b. Jackson, Ohio. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add $1.00 per ton for low impurities, not to exceed: P—0.05%, S—0.04%, C—1.00%. Covered by MPR 405.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

(65-72% Cr. 2% max. Si)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10%	13.00c.	13.40c.	14.00c.
62-66% Cr, 5-7% C	13.50c.	13.90c.	14.50c.

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 2c. per lb. to regular low-carbon ferrochrome price schedule. Add 2c. for each additional 0.25% N. High-carbon type: 66-71% Cr, 4-5% C, 0.75% N. Add 5c. per lb. to regular high-carbon ferrochrome price schedule.

Low-Carbon Ferromanganese

Contract prices per lb. of manganese contained, lump size, f.o.b. shipping point, freight allowed to destination, Eastern Zone. Add 0.25c. for spot sales.

	Carloads, Bulk	Ton Lots	Less Ton
0.10% max. C, 1 or 2% max. Si	23.00c.	23.40c.	23.65c.
0.15% max. C, 1 or 2% max. Si	22.00c.	22.40c.	22.65c.
0.30% max. C, 1 or 2% max. Si	21.00c.	21.40c.	21.65c.
0.50% max. C, 1 or 2% max. Si	20.00c.	20.40c.	20.65c.
0.75% max. C, 7.00% max. Si	16.00c.	16.40c.	16.65c.

Ferrochrome Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 60 per cent contained chromium. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	8.25c.	8.55c.	8.95c.
Ton lots	8.75c.	9.25c.	10.75c.
Less ton lots	9.00c.	9.50c.	11.00c.

Ferromanganese Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 66 per cent contained manganese. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	6.05c.	6.30c.	6.60c.
Ton lots	6.65c.	7.55c.	8.55c.
Less ton lots	6.80c.	7.80c.	8.80c.

Calcium—Manganese—Silicon

Contract prices per lb. of alloy, lump size, f.o.b. shipping point, freight allowed to destination.

16-20% Ca, 14-18% Mn, 53-59% Si. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carloads	15.50c.	16.00c.	18.05c.
Ton lots	16.50c.	17.35c.	19.10c.
Less ton lots	17.00c.	17.35c.	19.60c.

Calcium Metal

Eastern zone contract prices per lb. of metal, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. Add 0.9c. for Central Zone; 0.49c. for Western Zone.

	Cast	Turnings	Distilled
Ton lots	$1.80	$2.30	$5.00
Less ton lots	2.30	2.80	5.75

Chromium—Copper

Contract price per lb. of alloy, f.o.b. Niagara Falls, freight allowed east of the Mississippi River. 8-11% Cr, 88-90% Cu, 1.00% max. Fe, 0.50% max. Si. Add 2c. for spot sales.

Shot or ingot	45c.

Ferroboron

Contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.20	$1.2075	$1.229
Less ton lots	1.30	1.3075	1.329

Manganese—Boron

Contract prices per lb. of alloy, f.o.b. shipping point, freight charges allowed. Add 5c. for spot sales.

75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.89	$1.903	$1.935
Less ton lots	2.01	2.023	2.055

Nickel—Boron

Spot and contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination.

15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, Balance Ni.

	Eastern Zone	Central Zone	Western Zone
11,200 lb. or more	$1.90	$1.9125	$1.9445
Ton lots	2.00	2.09125	2.0445
Less ton lots	2.10	2.1125	2.1445

Other Ferroalloys

Ferrotungsten, Standard grade lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungstein, 10,000 lb. or more	$1.90
Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.	
Open hearth	$2.70
Crucible	$2.80
Primos	$2.90
Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal	$1.50
Vanadium pentoxide, 88-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5	$1.10
Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)	
Carload lots	25c.
2000 lb. to carload	26c.
Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)	
Carload lots	58c.
2000 lb. to carload	59c.
Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis	
No. 1	87.5c.
No. 6	60c.
No. 79	45c.
Bortram, f.o.b. Niagara Falls	
Ton lots, per lb.	45c.
Less ton lots, per lb.	50c.
Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.	
2000 lb. lots	$2.35
Under 2000 lb. lots	$2.30
Ferrotitanium, 40-45%, 0.10%C. max. f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained Ti	$1.23
Less ton lots	$1.25
Ferrotitanium, 20-25%, 0.10%C. max., ton lots, per lb. contained titanium	$1.35
Less ton lots	$1.40
High-carbon ferrotitanium, 15%-20%, 6-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y. freight allowed East of Mississippi River, north of Baltimore and St. Louis, per carload	$142.50
Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton	$58.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton	$75.00
Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo.	95c.
Calcium molybdate, 40-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo	80c.
Molybdenum oxide briquets, 48-52% Mo f.o.b. Langeloth, Pa., per lb. contained Mo	80c.
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo	80c.
Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales	
Carload lots	14c.
Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy	
Carload, bulk	4.6c.
Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk	5.75c.
Ton lots	7.25c.
Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.	
Car lots	8.00c.
Ton lots	8.75c.
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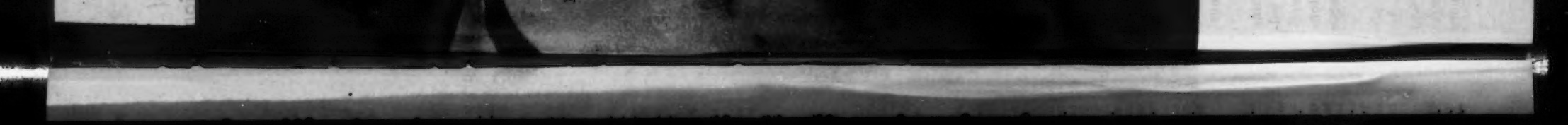

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BALDWIN

Report on Wartime Steel Production, Consumption

(CONTINUED FROM PAGE 107)

much major steel-consuming uses as automobiles, trucks, and refrigerators.

In early fall of 1941, activities in steel were concerned primarily with supplementing and rounding off the August moves. In September, the Iron and Steel Branch submitted a plan envisaging addition of 10 million tons of annual steel ingot capacity, to be supported partly by the blast furnace expansion launched in August. Shortly, thereafter, SPAB approved of this program, basing its action in part upon revised estimates placing direct military requirements at 16.7 million tons in 1942 and 18.1 million tons in 1943. Scrap came under full allocation Oct. 10, in a further effort to improve the gradually worsening materials situation. Production quotas for many civilian end-products underwent further reductions about the same time. And at the close of the month, work was in progress to increase plate rolling mill capacity by construction of sheared plate mills and conversion of those continuous strip mills best adapted to roll light plate tonnage.

The war brought bewildering changes in the status of most metals, but for none perhaps more suddenly and more completely than for steel. All previous estimates of forward military and war-supporting needs were rendered almost worthless. Estimates of requirements for specific programs and products likewise became obsolete. And no one knew what value could be attached to the pattern of producers' forward bookings, upon which main reliance had been placed for a picture of near-term overall demand and longer-term product "mix."

Within two months, however, the atmosphere had cleared sufficiently to make it evident that, if the war effort were not to bog down seriously for lack of steel, four things must be done:

(1) Make available to consuming industries a substantially larger volume of finished steel products, probably the equivalent of 90 million tons of steel ingots in 1942 and still more in 1943.

(2) Increase the volume of plate for essential uses (direct military, defense construction, lend-lease, and such important war-supporting items as freight cars) 75 per cent or more

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above its average rate in late 1941.

(3) Effect a huge expansion in the production and a marked change in the distribution of high quality alloy steels.

(4) Develop much more stringent methods of controlling the production and distribution of rolled and drawn steel products as a whole.

The job of increasing the overall quantities of steel available for military and war-supporting needs broke down into three parts: Providing sufficient raw materials to permit relatively full utilization of steelmaking furnaces; accelerating the expansion of basic iron making and steelmaking capacities; and mobilizing for war use inventories rendered idle and excess by shifts from peacetime production.

Expanding raw materials supply ranked as the most immediate. During the latter part of 1941 producers had run into shortages of metallics (pig iron, scrap, and charge ore). By early 1942, several openhearth furnaces had been forced to shut down, and expectations were that the situation would worsen sufficiently to hold ingot production below its 1941 level of 82.4 million tons, thus making impossible fulfillment of urgent demands.

To forestall such a development, WPB had recourse to several drastic expedients. Orders were given to drive blast furnace stacks at the maximum rates possible. A strenuous and successful effort was made to open the Lake Superior ore shipping season earlier than ever before, and to keep carriers loaded to capacity. Producers were induced to use large quantities of scrap in the less desirable grades. A nationwide collection drive was instituted to bring remote and obsolescent scrap to the melting furnaces. WPB approved the use of experimental methods (for example, production of sponge iron) to add to the supply of high-grade melting stock. The inventory control provisions of the pig iron and scrap allocation orders were used to insure channelling of increased supplies to the tighter areas. And immediate steps were taken to enlarge the blast furnace expansion program and bring it into operation as speedily as possible.

The success of this campaign exceeded even the most optimistic expectations. By April, practically all openhearths were back in operation. In July, pig iron ceased to be a problem, and it became clear that despite the heavy shift to alloy grades, steel ingot production for the year would reach at least 86 million tons. And by the first part of 1943, scrap collec-

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tions had improved enough to warrant a sharp cut in allocation activity.

The outbreak of hostilities placed us in a very difficult position with respect to plans to increase basic iron and steelmaking capacities. On the one hand, the extreme pressure of demand for ingots and metallics made it imperative not only to add to the expansion of blast furnace capacity, but to realize both this capacity and that planned for steel furnaces more rapidly than contemplated in the SPAB-approved report of September, 1941. On the other hand, due to the huge quantities of steel and other materials required in their construction, there was serious doubt whether all the projects approved in this report should be kept in the picture. Both considerations pointed to the fact that only by a careful rescheduling of the whole program could we hope to adapt ourselves to the changed situation. WPB's Facilities Bureau worked intensively to push the program through. In the end, the amounts added came to 10,470,000 tons in the case of pig iron, and 9,275,000 tons in the case of steel ingots.

The job of redistributing steel inventories arose only after our rapid switch to a wartime basis. With this changeover, many large manufacturers found themselves unable to use much of the tonnage they had accumulated for peacetime production. Then, too, the flood of L-, P-, U-, and M-orders (including M-126, the famous steel conservation order) rendered idle and excess a large volume of material in fabricators' stocks. Finally, substantial amounts were frozen by changes in the scale and composition of war programs. The net effect was to create a huge mass of finished steel stocks potentially additive to mill supply, but requiring for this purpose to be transferred to other points in the economy.

Several steps were taken to effect such transference. One of the earliest (February 1942) was the formation of a Distressed Stock Unit within the Iron and Steel Branch of OPM to act as liaison between sellers and potential buyers. Following this, on July 7, 1942, WPB issued Priorities Regulation 13, permitting holders of idle and excess material to move it in accordance with established preference ratings. At the same time, the Steel Recovery Corp. was organized to absorb the Distressed Stock Unit and to formalize and systematize its functions. Various claimant agencies set up their own redistribution branches. By July 1943, most of the

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material available for reuse had been moved through these channels.

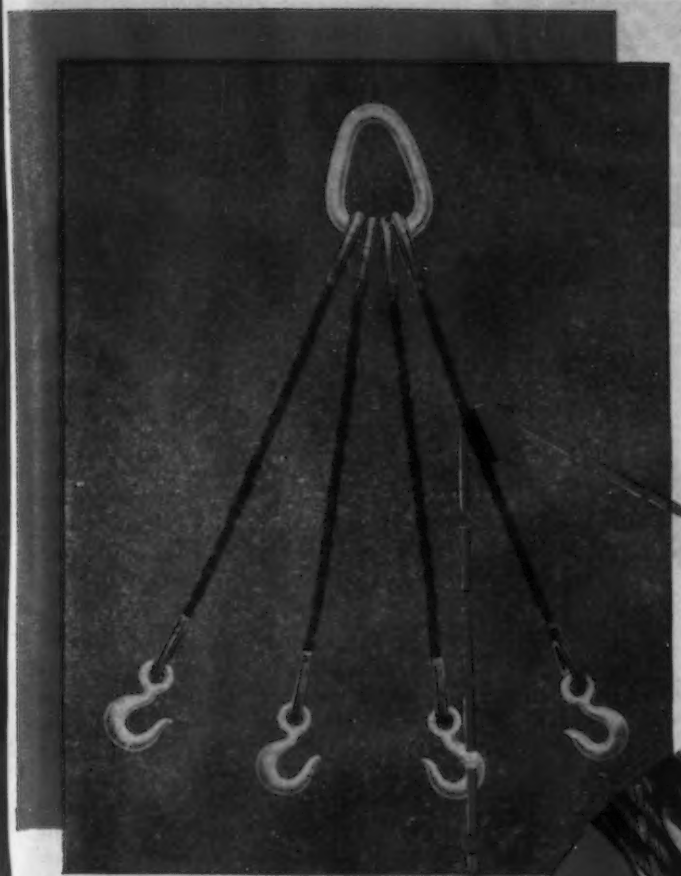
As a complement to the campaign to redistribute steel inventories held in mill forms, efforts were made throughout 1942 and 1943 to move excess stocks of fabricated steel parts. This phase of the work was handled by WPB's Redistribution Div.

Records are inadequate to permit exact measurement of the aggregate volume of steel recovered by redistribution activities. It is known, however, that the Distressed Stock Unit and its successor handled more than 1.5 million tons. Moreover, informed estimates place the movement under the terms of Priorities Regulation 13 in this neighborhood. And the Redistribution Div. and various claimant agencies rerouted substantial amounts. It seems conservative, therefore, to assume that, in the aggregate, not less than 4 million tons of finished shapes (the equivalent, in steel ingots, of 60 pct of the annual capacity added by the ingot expansion program) were pressed into service—the bulk of it during the period of our most urgent need.

The methods employed to deal with the post-Pearl Harbor plate crisis: Utilization of continuous strip mills, expansion of sheared plate mill capacity, and control over production and distribution bore a surface resemblance to those used during 1941. In scope, character, and results, however, the differences were immense.

Strip mill utilization plans underwent perhaps the most startling change. Until Pearl Harbor, these had been confined largely to the few units which were equipped to produce some plate tonnage in any case. Thereafter, the aim became wholesale and speedy conversion. Surveys were made immediately to determine the potential plate capacity of each continuous mill. Records showing in detail the kinds and quantities of mill auxiliaries (shears, cooling beds, conveying machinery) needed to realize such capacities were assembled, and arrangements made to install this equipment at the earliest possible date. Bottlenecks at the slabbing mill and reheating furnace stages were broken with little regard for cost and convenience. And the Iron and Steel Branch engaged to load each mill with plate tonnage as rapidly as space developed. As a result, within seven months production of strip mill plates rose more than 300 pct, and by August 1942, had come to represent over half of a vastly increased overall output.

Changes in the control mechanism



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were almost as drastic. Plates had been placed under full priorities in August 1941. But with Maritime, Navy, and Defense Plant demands skyrocketing, this measure proved inadequate, and it became necessary to establish a system of full allocation. Under this scheme put into effect in January 1942, each producer had to submit itemized order boards to the Iron and Steel Branch and to major claimant agencies. The latter were given the right to select, within the limits permitted by supply and other claimants' needs, the tonnage necessary to meet their programs each month. The lists of selected orders were then sent back to the mills and became their mandatory production schedules.

By the spring of 1942, it became apparent that, despite the rapidly rising production, even tighter supervision would be required over plates. Major changes, therefore, were made in the pattern of controls, notably: Establishment of a quota plan, under which both overall plate output and its distribution among claimants were set by the Requirements Committee each month; introduction of stringent inventory controls; and institution of a procedure requiring each claimant to justify the individual orders composing its quota in the light of its contractors' inventories, prospective rates of consumption, and end-products. In this form, the system represented one of the strictest and most successful control systems ever established by WPB for a widely used material.

Largely as a consequence of these measures, essential plate requirements had been brought into balance with supply by the spring of 1943. This led to the abandonment of direct plate allocations in favor of the general CMP steel controls on July 1, 1943. Since that date, plates have presented fewer difficulties, though in the first quarter of 1944, demands for landing craft and cargo vessels made necessary the institution of a modified quota plan.

The huge growth in military programs after Pearl Harbor brought alloy steel into much the same general position as plates, confronting a level of demand well beyond regular melting and finishing capacity. But the prospective unbalance was somewhat more serious in this case, and there was a critical shortage of basic alloying elements such as chromium, nickel, and tungsten. The alloy steel industry thus had three formidable tasks set before it: Development of

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adequate manufacturing and processing facilities; provision of the necessary supplies of ferroalloys; and establishment of controls to insure the most effective distribution of supply until the latter should become sufficient to meet all essential demands.

With respect to increasing production, the same instruments lay open to alloy producers as to steel plate producers; and, as in the case of plates, conversion came first in order of time and importance. The major action involved shifting basic open-hearth furnaces normally producing carbon steel ingots to the manufacture of alloy grades, wherever possible. In addition, steps were taken to eliminate bottlenecks in special processing and finishing departments and to divert labor and machinery to such operations. The conversion of melting facilities led to a substantial loss in overall output, due to the longer refining cycle on alloyed material but the gains were immediate and more than commensurate in terms of the relative importance of end products served.

Problems of expansion were tackled on three fronts. First, the Steel Div. undertook immediately to speed the installation of electric furnaces already in the building program. Second several new openhearth projects, mainly for the production of armor castings, were brought into the steel foundry expansion program. And third, novel steelmaking techniques (openhearth-electric furnace, cupola-electric furnace, and cupola-bessemer-electric furnace combinations) were introduced at several plants to shorten the refining cycle on furnaces already operating, and thus give increased production at a much earlier date and much less expensively in terms of critical materials than was possible through construction of new units.

So successful in fact were these efforts that in the spring of 1943, with the help of some reduction in requirements, the supply of alloy steel ingots overhauled demand. It became possible to defer part of the projected expansion program and to begin switching back openhearth capacity to carbon steel production.

Measures to redress the balance in ferroalloys were pushed even more vigorously, and with equal success. First came a drive to increase production and imports to the maximum extent possible. As the second step, radical changes were effected in metallurgical practices and specifications —substitution of the famous NE

steels for conventional SAE grades in so-called "constructional" uses, virtual elimination of nickel in ballistic test steels such as cast armor, and a major shift to molybdenum types in the field of tool steels—in order to reduce the average alloy content of steels serving given end uses, and to save nickel, chrome, and tungsten through increased use of manganese and molybdenum. The Steel Div. also initiated a campaign to increase the proportionate use of triple-alloy steels and to compel segregation of wastage from such material into well-defined chemical combinations, thus rendering possible maximum recovery of elements contained in scrap. By mid-1943, the last two actions had brought consumption of ferrochrome and virgin nickel some 25 pct below the average for 1941, and with increased availability of chrome ore and nickel matte, the supply of these elements appeared adequate to meet all steelmaking demands.

To cope with the problems of distribution, the Iron and Steel Branch, after several attempts to improve priorities procedure, came finally (May 1942) to direct allocations. The plan put into effect had as its basis the major elements in the plate allocation scheme.

The major reason for alloy steel quotas and melt schedules vanished with the achievement of balance in this grade during the spring of 1943. However, a modified version of the schedules was maintained to assist in ferroalloy conservation efforts and as insurance against a revival of demand.

The first major difficulties in the field of overall steel controls arose on the side of production. Experience indicated that exclusive dependence upon the priorities system as a scheduling device would prove self-defeating. There were four major reasons for this: The system did not provide machinery for spreading orders among the several departments of a given mill, or among producers of a given product, in such a way as to permit establishment of efficient production patterns; such difficulties were aggravated by constant inflation of ratings and rapid changes in the priorities pattern confronting each producer; nonintegrated mills were penalized severely by the system. These units could obtain raw material only by extending priorities to integrated plants, with the time-lags involved, constant inflation of ratings led to sharp curtailment in the tonnage produced for their account; the

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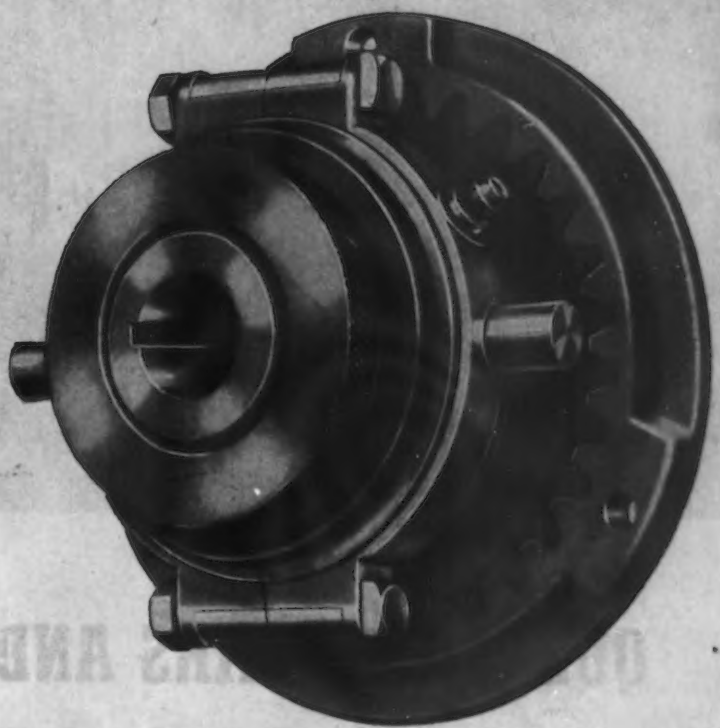

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Iron and Steel Branch could implement Requirements Committee allocations only by directing the necessary tonnage into mill schedules. This proved to be a disruptive factor even with the relatively small volume of allocations in early 1942, since the tonnage had to be imposed immediately and in most cases without detailed knowledge of product impact.

Work to devise some means of overcoming these difficulties had been undertaken by a group of Iron and Steel Branch consultants as early as February 1942. After intensive study, this group came to the conclusion that substantial relief could come only from a complete product-by-product scheduling of each steel mill, and offered a plan to achieve this goal. The plan envisaged establishment of a committee which would be empowered to meet regularly with each producer for the purpose of determining a proper and full distribution of the latter's capacity among various products, and to direct the producer to adhere to the agreed pattern. According to the plan, this distribution would represent a combination of allocations made pursuant to Requirements Committee decisions, and the best possible compromise among priority ratings, character of production schedules and backlogs, potential manpower needs, and directives set or contemplated for other mills.

By Aug. 31, the committee had issued directives to all large integrated producers. The smaller integrated producers and larger nonintegrated companies were covered within the next two months. And by the year-end, all steel mills had been brought within the system and were operating in accordance therewith. That it was possible to meet virtually all essential demands for steel in late 1942 and early 1943 was due in no small part to this speed of introduction.

Production directives were intended primarily to mend weaknesses in the system of production controls, not in the distributive machinery. In order to cope with the problems presented by such items as plates and alloy steel, it was necessary to modify drastically, or even to scrap completely, control by priorities. Within limits, this policy could be pursued without destroying the system. But when, by mid-summer, 1942, the process had been carried to a point at which more than half of total steel output (carbon steel plates, all alloy shapes, all material produced for warehouses, tinplate, all lend-lease steel, and such other tonnage as the mills were directed to

produce) was being handled by devices other than preference ratings. it became clear that the only solution lay in an integrated allocation plan for all users. The problem in steel was of paramount importance in the development of the Controlled Materials Plan.

The heart of the steel problem—balancing requirements against supply, holding total authorized procurement within the limits of anticipated production, and distributing allotments so as to maximize the total war effort—was attacked directly and largely resolved through CMP. During the two years of operation under the plan, therefore, the principal difficulties came from a series of technical operating problems. Among the more important of these problems were:

(1) The extent to which the anticipated supply should be over-allotted to compensate for the failure of authorizations to reach the mills (which acquired the label "attrition"). For the first two quarters we felt our way along, so to speak, overallotting moderately and keeping a close watch on developments. Actual production fell considerably short of anticipations—largely because of slippages in the facilities expansion program. Attrition in those early quarters, on the other hand, proved to be considerably higher than anticipated. These early estimating mistakes almost exactly canceled out; and by the beginning of 1944 techniques had been improved so much that for several quarters estimates of both supply and attrition proved remarkably accurate.

(2) The determination of whether overall allotments in terms of carbon steel and alloy steel would be adequate or whether each steel shape should be separately allotted. The decision was to screen requirements submitted in terms of shapes, limit use of some shapes (rail, plates, and others) by program control, and prune overall allotments for programs drawing heavily on shapes in tight supply. Minor unbalances were handled by production directives on flexible mill facilities.

(3) Adjusting programming levels and allotment policies following rapid changes in the supply-demand balance in successive quarters. In the spring of 1944, substantial cutbacks in many military programs opened prospects of an easy supply situation. This was handled by selective relaxation of limitation and conservation orders. During the second quarter, production declined and the burden of allotments

pushed the carryover of unfilled orders slightly above 10 pct of the total order load. In the fourth quarter, 1944, Army requirements were sharply up and the supply forecasts were at low levels, reflecting the drain of labor away from the mills. Special controls over rails were tightened to cope with the shell steel problem. Strikes and bad weather in the first quarter, 1945, brought output to the lowest level since 1943. The Steel Div. was forced increasingly to resort to special directives and mill overloads. The carryover rose to 14 pct. Allotments for the next quarter were screened more rigidly than ever; allotments already issued for supplemental nonmilitary production were canceled; a drive was launched, with WMP cooperation, to maximize ingot output and break bottlenecks in forwarding departments.

The military program reductions announced just before and just after VE-Day opened a prospect of an easier third quarter supply-requirements position, and a start was made toward lifting end-use restrictions. CMP authorizations were provided for essential programs only, the new nonmilitary consumption arising from relaxation of limitation and conservation orders to be supplied by whatever "open-end" steel might be available after taking care of CMP orders. There could, however, be no immediate marked increase in production of formerly prohibited civilian items, because the principal shapes required for their manufacture were sheets and strip — one area in which the steel situation showed only slight signs of easing.

The sheet and strip position grew progressively worse. The carryover of past-due orders had risen to dangerous heights. The mills were plagued by manpower shortages. Such reductions of requirements as developed in some military programs were offset by mounting Pacific War requirements in others. Many of the large sheet-using component programs had been granted increases of third quarter allotments to permit inventory replenishment, following drastic second quarter cuts. The bulk of such increases as had been authorized for essential civilian product programs concentrated in items—farm machinery, trucks, freight cars, refrigerators, washing machines—which require a large proportion of sheet steel.

To cope with the situation, intensive efforts were directed toward clearing space on sheet and strip mill schedules. Export orders were reviewed,

and a substantial tonnage was canceled. Prime contractors were pushed to pass cuts in schedules back to the steel mills. The permissible level of consumers' inventories was reduced from 60 to 45 days' supply. Sheet and strip producers' schedules were frozen against further acceptance of third quarter orders, except as specifically directed by WPB, and the rules were amended to make optional with producers the displacement of open-end tonnage by CMP orders offered less than 30 days before the specified month of delivery. This measure was designed to insure that space freed by the cancellation drive and inventory reduction would effect a reduction of the carryover and increase acceptance of unrated orders, where this could be done without jeopardizing production of urgent CMP orders.

With the advent of VJ-Day, military programs were so drastically cut back that the retention of end-use restrictions was obviously unnecessary, and limitation and conservation orders were revoked wholesale. CMP was terminated as of the end of the third quarter. Inventory restrictions were retained in order to forestall hoarding, and a few limitation orders were kept for special purposes. For example, that governing the use of tinplate was kept in order to help conserve our limited stocks of tin. Finally, a simplified priorities system with two ratings was instituted, the first to protect military orders of high urgency and the second to break reconversion bottlenecks. Otherwise, steel has been completely freed of wartime control.

For 1946 as a whole, finished steel demand is estimated to be in the neighborhood of 58.6 million tons, or some 2.6 million tons below estimated first-line production capacity, excluding high-cost capacity. The bulk of this indicated surplus, however, is expected to materialize in the first six months, with second-half demand pressing closely upon supply, or perhaps even slightly exceeding the latter. Some difficulties may be experienced, therefore, if the pace of reconversion should so differ from that forecast as to throw an even larger part of total demand into the second half. Present expectations are that, should such difficulties arise, they will be distributed among shapes, geographic areas, and customers in such a way that little, if any, real hardship will result.

Effective steel product capacity has been set at 15.2 million tons per quarter in the first half of 1946, and about

15.4 million tons per quarter in the last six months—respectively 15 pct and 14 pct below nominal capacity, assuming 100 pct utilization of all ingot making and foundry furnaces and a normal product mix. The deductions reflect allowances for the inability of some specialized war-built facilities quickly to adapt themselves to post-war product demands; the expected dismantlement or retirement of high cost obsolete furnaces, plus time lost for renovation of long overworked, under-maintained facilities—expected to be more significant tonnagewise in the first half of 1946 than thereafter; and probable decline in production of steel castings as a result of reduced demand for military use.

The quarterly estimates presume maintenance of current cost-price ratios. A rise in costs relative to prices, or a rise in prices relative to costs, might lead to some change in availability. It seems clear, however, that changes in the ratio would have to be very sharp to affect availability significantly.

Estimates of Steel Requirements in 1946
Thousands of Tons

Product	1940	1946
Producers' durable goods	14,918	22,476
Agriculture machinery and farm equipment	1,605	2,828
Industrial machinery and equipment	2,007	2,900
Machine tools and other metalworking machinery ..	339	435
Industrial electrical equipment	721	870
Railroad equipment, rails and accessories	4,858	6,090
Engines and turbines	399	435
Business machinery and equipment	337	653
Subsidiary durable equipment	1,984	3,335
Commercial motor vehicles ..	2,618	4,930
Consumers' durable goods	7,850	9,896
Passenger cars	5,961	7,250
Radios and phonographs	17	36
Refrigerators	500	1,015
Other consumers' durables ..	1,372	1,595
Consumers' nondurables	300	363
Services	70	73
Construction	7,892	6,743
Petroleum and gas	2,248	2,538
Containers	2,356	3,263
Barrels, kegs and drums	684	870
Exports	3,623	6,388
Direct military	985	798
Increase in inventories	3,344	4,713
Total	49,270	58,621

1940 consumption based on Div. of Civilian Supply Report, "Allocation of Steel to Civilian End-Products," Mar. 2, 1942. 1946 demand was derived by translating forecasts of 1946 GNP made by General Economics and Planning Staff. The general method followed was to calculate 1940 ratios of tons of steel to dollar values of GNP categories shown in the table. The corresponding 1946 dollar values were then multiplied by these ratios with the price level in the two years assumed to be the same. Estimates for several important items, such as containers, which could not be distributed among GNP categories, represent rough GEPS estimates of the demand for these products. Export demand estimated by the Materials Div. Inventory demand is estimate made by the GEPS.

The detail of the demand estimate, together with a statement of the gen-

eral method employed in its derivation, is set forth in the table above. Certain qualifications should be noted:

(1) Total demand in the first half of the year is expected to run between 27.5 million and 28 million tons, and in the second half between 30.6 million and 31.1 million tons. These figures indicate a surplus in the first six months of between 2.9 million and 2.4 million tons, and a range in the last six months from a surplus of 200,000 tons to a possible deficit of 300,000 tons.

(2) The figure of 7,250,000 tons shown for passenger cars represents production requirements for some 4.5 million cars. Many forecasts have placed the output of cars at a substantially higher level, but the best evidence at hand suggests that performance will not exceed this level by any substantial amount.

(3) Export demand has been set at 6,888,000 tons, some 4.3 million tons above 1939 deliveries but, on the other hand, roughly 1.7 million tons below shipments in 1940, when the level of general activity ran somewhat below that forecast for 1946. The reduction from the 1940 export level reflects allowance for the huge British demands for defense purposes in this year, and expected decline in Latin American demand as a result of recent increases in steelmaking capacity in that area.

(4) The estimates provide for inventory rebuilding in the amount of 4.7 million tons. It is quite possible that consumers will undertake to replenish stocks at a rate higher than this figure implies. If this proves to be the case, additional demand can be absorbed in the first half of the year, when inventory rebuilding is most likely to occur. On the other hand, if increases should be concentrated in the latter half of the year, additional pressure would be placed on scarce supplies.

The picture presented by most steel products resembles the over-all outlook, but with two or three notable exceptions. In light gage flat-rolled products, it seems probable that total demand, for production and repipelining purposes, will exceed maximum supply during the next six months, with galvanized material showing a deficit of as much as 10 pct to 15 pct. Present expectations, however, are that the deficit will change to a surplus around April or May of 1946, despite a continued rise in demand and a tightening general position.

A. O. Smith Develops Glass Lined Steel Silo; Engine Driven

Milwaukee

• • • **The A. O. Smith Corp.** has developed a glass-lined and glass-coated exterior steel silo that is unloaded mechanically from the bottom, and that will keep silage unspoiled by keeping it air-tight. **The silo already** has been subjected to tests and is to be in production for the 1946 corn crop.

Silage is removed through a 24-in. hopper opening at the bottom which

is operated by an engine-driven mechanism. The engine feeds "burned out" air into the top of the silo to keep out the oxygen which molds must have, thus eliminating spoilage. The silo is about one-sixth the weight of a standard concrete silo. The cost is comparable.

It came to the attention of Wesley G. Martin, research engineer in charge of the farm equipment division of the A. O. Smith Corp., that in silos there were cost factors of spoilage, labor and hazard which if corrected would be of inestimable value. Martin had earlier developed a method of coating steel with a thin glass surface, a process used for manufacturing glass lined storage vessels, water heaters and vessels for industrial use. A special type of glass is fused to the steel under high temperature, becoming a part of the steel, and able to bend with it.

From the mouth of the hopper an agitator mast projects a few feet into

the silo. Attached to it are short lengths of heavy, flexible tubing equipped with weights. The 6 hp engine turns the mast at about 30 rpm and the weights are designed to knock down enough silage to avoid "bridging." Small blades in the mouth of the hopper force the silage out.

A large metal pipe can be extended from the hopper into the barn. A worm gear inside the pipe, turned by the engine, moves the silage right into a cart or wheelbarrow.

A specially adjusted carburetor on the gasoline engine produces an exhaust gas similar to the atmosphere in the silo, that is about 75 pct nitrogen, 12 pct carbon dioxide, small quantities of water vapor and other minor elements.

The silo is filled through a pipe running up the inside, with the intake nozzle projecting out a few feet above the ground. The pipe that takes the burned air to the top of the silo can be opened to become an air overflow pipe during filling operations. Because it might be desirable to get into the silo on rare occasions, a manway has been provided at the base.

Ohio Compensation Rules Are Modified

Columbus, Ohio

• • • **Four important changes** in the Workmen's Compensation Act affecting injured workers and those afflicted with occupational diseases would become effective Oct. 12, the Ohio Industrial Commission reported this week.

According to the Commission, the changes were made to conform with liberalized workmen's compensation voted by the last legislature. They apply only to injuries and occupational disease disabilities occurring on or after Oct. 12. Principal changes from the present law were listed as:

1. Maximum weekly rates increased from $21 to $24.50. This increase to continue in effect to Sept. 30, 1947, and then revert back to the present maximum weekly rate of $21.

2. Maximum death award to widow or dependents of a killed employee increased from $7,000 to $7,500.

3. Period of time for filing of a silicosis claim has been extended to a period not to exceed six months after diagnosis by the disability of a licensed physician. In silicosis cases the claimant now has the right to go back eight years before disability began to show an injurious exposure.

Describes Statistics Used in Correlating Metallurgical Data

Chicago

• • • Statistical methods used in correlating metallurgical data were described and demonstrated before the Chicago Chapter of the American Society for Metals, Oct. 11, by Irving W. Burr, associate professor of mathematics, Purdue University.

He dealt specifically with calculation of correlation coefficients as a means of metallurgical control. He pointed out that, although the effect of variables sometimes was obvious,

Irving W. Burr

in many borderline cases correct use of statistical methods is necessary to achieve correct results.

Using as an example a record of several heats of steel, he demonstrated methods of determining the relationship of such variables as ladle carbon, ladle manganese, pouring temperature, average sealing time, and pit time with rejections. As a preliminary step he recommended plotting a series of graphs with rejections shown on the ordinate axis and the independent variable on the abcissa of each graph.

Such graphs, he said, were useful in showing consistency of relationship, exceptional points from the trend which should be eliminated from the study, and sometimes a curvilinear tendency indicating a direct relationship.

As a second step, he discussed calculation of correlation coefficients as means of picking out influential properties, control of influential properties, predicting tensile strength and hardness, and for comparison and determination of significance of different tests.

Urges Management Aid For Prosperous Growth Of Smaller Business

Boston

• • • **Smaller business needs more than easy access to capital if it is to grow and be healthy; it needs management aid, Richard L. Rosenthal says, in an article entitled "Rx for Smaller Business" in the autumn number of the *Harvard Business Review*. Mr. Rosenthal is head of Industrial Counsel, vice president and director of York Safe & Lock Co., and an officer and director of a number of other companies.**

"Sympathy for smaller business has been loudly proclaimed and turned to political advantage," says Mr. Rosenthal, "with particular emphasis placed on the inability of smaller business to obtain capital at a reasonable cost . . . Regardless of the political appeal of this point of view, experience with smaller business indicates that availability of capital is relatively secondary compared with the primary problems and difficulties which develop because smaller business is often inadequately organized, particularly to provide proper management in all the areas vital to efficient operation.

"These problems and difficulties stem largely from the fact that successful smaller businesses usually owe their existence to the particular talents, dynamic but limited, of one man, who is usually the owner of the so-called smaller business. And the real dilemma arises when a successful smaller business begins to grow large enough to need the application of additional management skill.

"Although many smaller businessmen recognize their dilemma and are anxious to have it solved, in most cases they unfortunately do not know what the solution is or how to go about achieving it; and in other cases the solution may, at first glance, seem to be too expensive . . . Moreover, since resetting business involves multiple skills and a variety of experience, it hardly falls within the realm of the services which can be provided by an accountant, lawyer, or advertising agency—or, for that matter, by any other single-activity specialist."

"In contrast," says Mr. Rosenthal, "qualified industrial consultants bring to a problem multiple skills . . . They apply the results of wide experience gained in a broad study of a number of companies in many industries." And he goes on to suggest that it

would be to the benefit of the national economy "to make arrangements whereby competent industrial consultants could spend one or two days every month with the owners or top personnel of smaller businesses."

But how can this be accomplished? Mr. Rosenthal rejects federal subsidies. The services provided by the Smaller War Plants Corp. is essentially on a subsidy basis and was acceptable in wartime because of the dual necessities of increasing war production and of making sure that smaller companies would not be forced out of business by reason of restrictions which eliminated the possibility of manufacturing normal products. A similar arrangement in peacetime hardly seems desirable inasmuch as it would continue to develop a greater reliance on the Federal Government, which, in turn, makes business generally less able to stand on its own feet . . .

"A more satisfactory approach to the solution of the problem, with only a measure of governmental assistance," he declares, "could revolve around local rather than national government. This would involve the establishment of 'community development corporations' on a city, county, or statewide basis. Such a corporation could procure part of the funds for its operations from the governmental authority which participated in its formation, and might obtain the balance from civic organizations or private sources interested in the industrial development of the area it served.

"Among the services which a community development corporation could provide are: assistance in obtaining suitable plant facilities for smaller businesses; assistance and guidance or perhaps, in unusual cases, actual commitments in providing sufficient funds for establishment or expansion; and, from the point of view of facilitating growth of smaller businesses, management assistance."

Mr. Rosenthal also feels that it would be to the advantage of credit pools and large metropolitan banks to "make available the occasional services of a qualified industrial consultant by retaining a firm on an annual basis. Under this arrangement a small additional charge could be levied against the borrower, for which he would be provided with regular monthly consultation by the industrial consultant firm . . . Over a period of time, as the borrowing customers were assisted in developing their businesses through proper organization and

adoption of proper basic policies, the expanded volume of their activities would make them larger, as well as more reliable, customers."

"Advertising agencies," he continues, "might find that the provision of management advisory service would be an excellent way to help smaller clients grow and thus develop into big advertisers. And raw materials suppliers should contemplate the possibility that provision of assistance of this type to smaller fabricating consumers of their raw materials might well aid these in so expanding their businesses that the additional raw materials they would purchase would pay many times over for the cost of the assistance . . . An alternative program which seems to promise greater maturity and independence might evolve along cooperative lines . . . a group of smaller businesses hiring a firm of industrial consultants on a full-time, annual basis." The author also suggests an arrangement whereby smaller businesses might "individually arrange for service by experienced industrial consultants."

Mr. Rosenthal's final proposal is as follows: "The postwar period should see the establishment, or existence, of a new kind of investment trust, which would be formed with the exclusive purpose of providing smaller businesses with both temporary and permanent risk capital and management assistance on fundamental organization and basic policy levels. Such an investment trust would fill the most marked void in the system by which capital is now obtained by business enterprise . . . Together with industrial consultants, this group of experts could provide smaller businesses with the continuing guidance they need."

AAF Exhibits Latest Weapons at Wright Field "Air Fair"

Dayton, Ohio

• • • **The Army Air Forces** pulled all the stops out of its development work last weekend and unveiled an exhibition of nearly all of its weapons—seven acres of exhibits whose powers would make Buck Rogers pale in embarrassment.

The objective was to dramatize the need for continued large sums of money to maintain research and development work in the Air Technical Service Command, headquartered at Wright Field. The army people probably will be able to mark the project, "mission accomplished." Senators and others who attended the showing came away unanimously of the opinion that the nation is doomed unless it can hold its present advance research position.

Typical of the armament wonders open to the public eye for the first time last weekend were guided missiles, able to move under positive control direct to an objective as small as a backyard. The ROC high angle bomb carries a television receiving and transmitting station in its nose. The camera picks up the terrain in front of it and the transmitter flashes the picture back to a bombardier in the "mother plane." As the bomb follows the trail toward its destination, it can be controlled at will by the bombadier, so he can direct it into the bullseye. Another television controlled bomb, the GB-4, was said by attendants to have a 15-mile range glide when dropped at 10,000 ft. Still another bomb, the VB-1 Azon is an ordinary bomb to which a radio-controlled fin has been added. An indication that these weapons have already been obsoleted by others was contained in placards heralding the "Razon" bomb, and the simultaneous word that it was still on the restricted list.

Aircraft engines of large size were displayed. Largest of these was a 36-cylinder Lycoming radio engine, the XR-7755, weighing 5500 lb and turning up 5000 hp. This air-cooled radial has nine cylinders clustered around the crank, and four such banks of them.

Chrysler Corp. was revealed to be in the airplane engine race with XI-2220-11, a 16-cylinder liquid-cooled V-engine producing 2500 hp with 2430 lb. of weight. Its two-piece crankshaft was bolted together at the center. This engine was designed for installation in a forward version of the Republic P-47.

Continental Motors Corp. was credited by attendants with producing the most outstanding weight-horsepower ratio yet achieved in aircraft engines. Its 12-cylinder liquid-cooled V-type

unit, the XI-1430-25, produces 2100 hp with 1445 lb of weight. It was designed for two planes, the Lockheed P-49 and the McDonnald P-67, neither of which appear ever to have been ordered into production.

Old line plane engine makers were also represented in this race for high horsepower supremacy. The Wright R-2160 Tornado is a 42-cylinder affair, with seven radial cylinders in six banks. It is designed for pursuit aircraft, obviously of class hitherto not yet achieved even in the big P-75 or others of that size.

Pratt & Whitney was represented with its Wasp Major R-4360-C, producing 3500 hp with 3470 lb of weight. Designed for big bomber and cargo installations, this single-stage, one-speed supercharged unit has automatic water injection.

The Allison double-V 3420 was also shown, with placards indicating that it was designed for installation in the Douglas XB-42-B, the military equivalent of the forthcoming DC-8.

Shown also was the General Electric J-33 jet engine, which powers the P-80. Information was that the first jet job was flown in a P-59 on November 1, 1942, much farther back than generally realized. And the indication was plain that the J-33 engine has already been outmoded, because by its side at the Air Fair was a J-35 which had the look of being a definitely improved version.

In the aircraft laboratory exhibit was a tailless glider, the XFG-1, a powerless flying wing. Constructed with a swept-forward wing, the glider is designed to be towed without a pilot. Its purpose is to carry additional fuel.

Not far away was the P-80 Shooting Star, and for the first time performance specifications were made available. The ship has range of approximately 1300 miles and carries 804 gal of kerosene as fuel. It is armed with six 50 caliber Browning machine guns and can accommodate a 2000-lb bomb load.

The pilotless radio-controlled airplane, the PQ-14, was shown in flight. The PQ-14 is a low-wing monoplane powered with a six-cylinder 155 hp Franklin engine and manufactured by the Culver Aircraft Corp. Trailing behind the PQ-14 at a safe distance, a pilot sitting in the co-pilot's seat of the "mother plane," holds the metal stick control box in his lap. The PQ-14 has been used as a target plane for training anti-aircraft gunners.

This, then, was the showing of what has been done with approximately $50 billion spent by ATSC from 1940 to the end of the war, including more than $3 billion for expansion of facilities. It resulted in the production of 18,024 B-24 liberators and 9,594 C-47s. It made possible the shipment of 94,189 planes overseas.

ATSC, looking to the future, has mapped out an agenda and a bill of desires. In the electrical branch, for instance, it is looking for an effective lightweight gas turbine which can be the generating source of 400-cycle alternating current power; it foresees the possibility when planes may be driven by electrically actuated motors, because at 400 cycles AC, motors and generators drop in weight to 12 pct of the weight of motors and electrical equipment common to household use with 60 cycle current. Already the Air Forces has developed a seven hp motor weighing but 13 lb.

Indicative of the scope of its forward outlook, the ATSC is looking for instruments indicating true air speed of aircraft up to 1000 mph, and capable of measuring the speed of missiles up to 4000 mph. It wants to be able to indicate and measure the true height of aircraft up to 80,000 ft, and of missiles up to 80 miles. It seeks a simple means of alloying steel for structural use in aircraft and missiles to reduce magnetic permeability and therefore reduce effect on magnetic compass elements.

To do all these things, and many others, the Air Forces need money, and that motive lay behind the unveiling last weekend of what it has already accomplished.

To Make Metal Hangars

Canton, Ohio

• • • A postwar industry with an entirely new product, metal hangars for private planes, was established here this week with the incorporation of Spiker Products, Inc. The hangars, planned to meet the anticipated postwar boom in private flying, will be built from an original design worked out by the company. Capital stock is set at $100,000.

Ralph Spiker, head of the new company, said that plans for a plant at North Canton will proceed at once with the erection of a 60 x 60 ft building with utility front containing offices and other departments. The building is to be finished by the first of the year and production will start as soon as it is ready.